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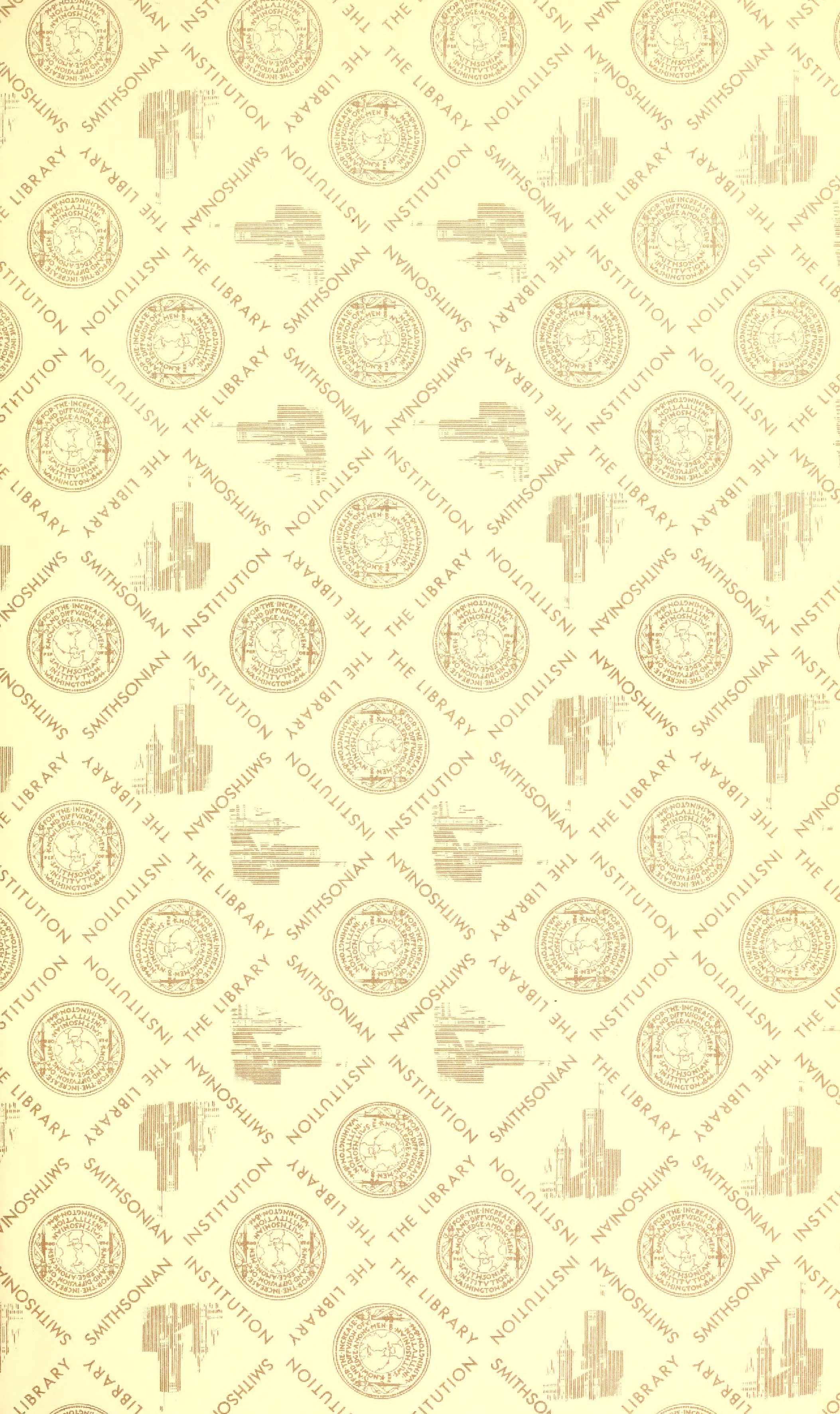
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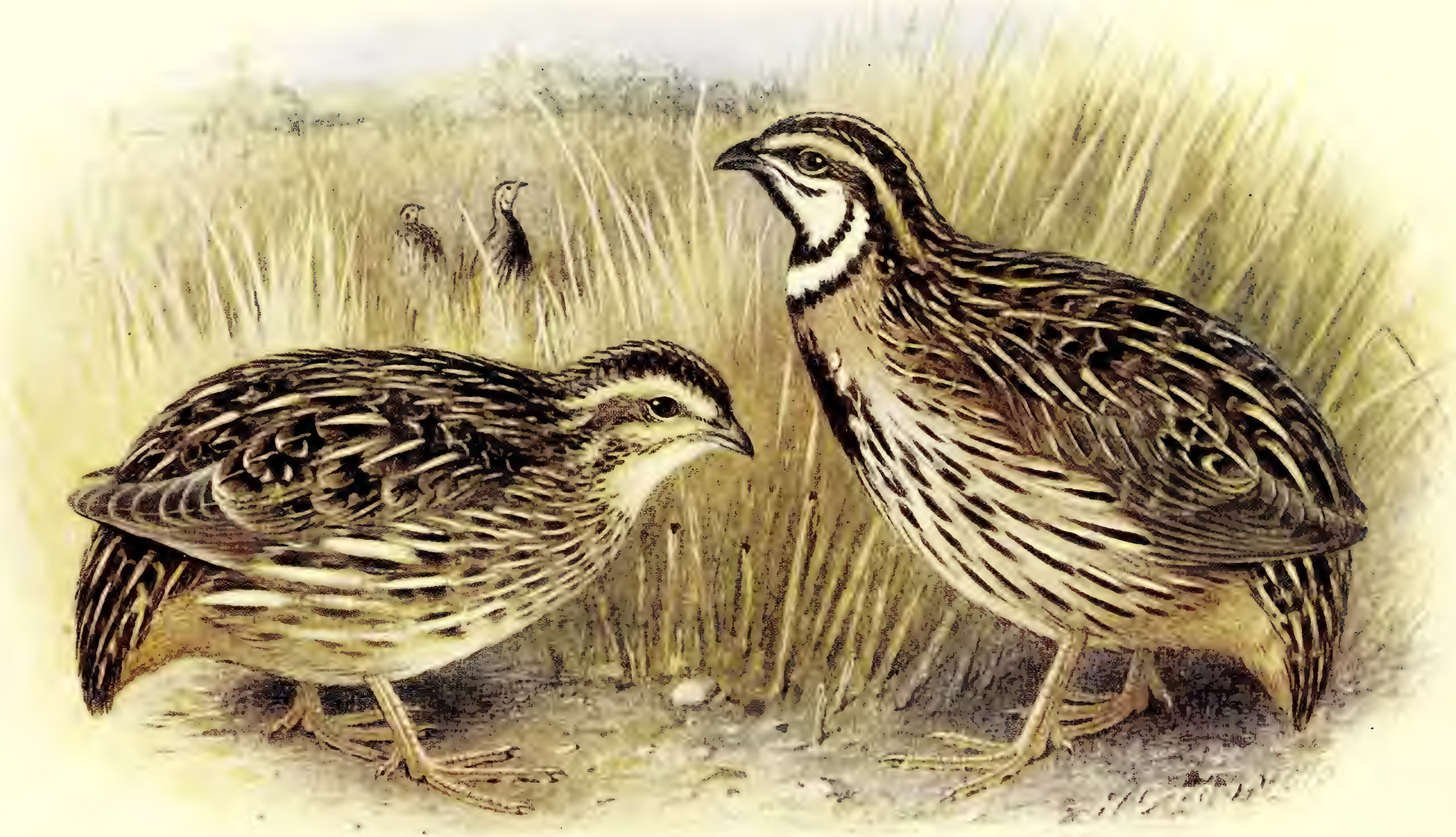

female. THE BLACK-BREASTED or RAIN QUAIL male.

Coturnix coromandelicus

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THE GAME BIRDS OF INDIA, BURMA AND CEYLON.

BY

E. C. STUART BAKER, F.L.S., F.Z.S., M.B.O.U., C.F.A.O.U.

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Coturnix coturnix Sharpe, Second Yarkand Miss., p. 122, (1891); Grant, Ann. and Mag. Nat. Hist., (6), X, pp. 167, 168, 169, (1892); Grant, Cat., Birds, B.M., XXII, p. 232, (1893), (part); Grant, Handb. Game Birds. 1. p. 180, (1895), (part); Oates, Man. Game Birds, 1, p. 80, (1898); Oates, Cat. Egg. Brit. Mus., 1, p. 44, (1901); Hartert, Nov. Zool., XXIV, p. 420, (1917), (part); Meineitzhagen, Ibis, 1920, p. 187, (Quetta); Ticehurst, ibid, 1922, p. 532, (Sind).

Coturnix coturnix coturnix Hartert, Vogel, Pal. Faun., III, p. 1938, (1921), (part); Whistler, Ibis, 1922, p. 436, (Jhang).

Vernacular names.—Bhator, Burra bhater, Gagus bhater, (Hin. Upper India); *Buttairo, Butteyra,* (Sind); *Bhatsi,* (Lower Bengal); *Gundri,* (Ooriah); *Soipol,* (Manipur); *Daobui kashiba,* (Cachari); *Bota sorai,* (Assam); *Ngon,* (Burma); *Lowa,* (Ratnagiri); *Bura ganga* and *Burgangi, Gur-ganj,* (Poona, Sattara); *Burli,* (Belgaum); *Gogari-yellichi,* (Telegu); *Peria-ka-deh* (Tamil); *Sipalé-hake* (Canarese, Mysore); *Budina,* (Turki); *Watwalak,* (Kashgar).

Description—Adult Male.—A broad coronal streak and supercilia from forehead to nape, and a few streaks on the forehead buff; feathers of crown, nape and hind-neck black with broad terminal bars of brown, almost concealing the black; lores buff; back, rump and upper tail-coverts light brown with narrow wavy rufous-buff bars bordered with brown and with longitudinal buff streaks; scapulars and wing-coverts like the back but with the rufous and black patches almost concealed, and with the central streaks broader and edged with darker; the wing-coverts with numerous pale bars; quills light brown, the first primary with a very pale buff or whitish outer web; the remaining quills barred on the outer webs with buff and dark brown and the innermost secondaries with buff bars and some blackish markings on both webs; tail blackish-brown with buff cross bars and streaks; a narrow line from the gape and ear-coverts dark brown, the line produced behind the ear-coverts to the nape and the end of the supercilium; centre of chin to throat dark brown with a broad band of the same colour across the throat to the ear-coverts, and a second similar, but narrower band lower down; between the two bands and between the centre of the throat a dark loreal line creamy buff; breast below the second gorget rufous buff, varying much in depth and marked with glistening pale buff shaft streaks; flanks brown with broad black-edged pale streaks and suffused with rufous; abdomen and lower tail-coverts creamy white to pale buff.

Individuals vary greatly in general depth of colour, owing to the extent of the buff or the darker markings, but the great variation in the colour of the throat referred to by Hume and Dresser is accounted for by the fact that they both included all the geographical races under the one name of *communis.* Even restricted to typical *coturnix,* however, the breadth and depth of the throat streak and gorgets does vary considerably and in some, the colours of the head are much richer than in others.

Colours of Soft Parts.—Iris varies from light hazel to deep brown; the bill may be almost any tint of bluish, greyish or brownish horny, generally darker at the tip and often also along the culmen; legs and feet pale fleshy, yellowish fleshy, fleshy brown or, rarely, light brown.

Measurements.—Total length about 180 to 200 mm.; wing 100 to 117 mm.; tail 36 to 39 mm.; tarsus about 30 mm.; culmen about 12·5 to 13·5 mm. I can find no average difference in size between specimens of true *coturnix* from different localities although the individual variation is great.

Female.—Differs from the male in having the centre of the chin and throat creamy white or buff, concolorous with the sides; the upper gorget is broken across the throat and the lower gorget is generally narrow and ill-defined, and also broken in the centre. The breast is generally spotted with black, profusely so in the young, less so in older birds and even absent altogether in a few old birds.

Colours of Soft Parts.—As in the male.

Measurements.—The sexes do not appear to differ in size, except that the female has a rather smaller bill. Wing 105 to 118 mm.; tail 32 to 39 mm.; tarsus 30 mm.; culmen 11 to 12 mm.; and in some European specimens 13 mm.

Chick in Down.—Crown rufous-brown, a broad central black streak commencing on the anterior crown, and dividing into two on the hind crown and nape where it encloses a buff central patch; back buffy rufous with a broad black central band; wings buff with black patches; below pale fulvous.

Chick in First Feather.—Head as in the chick in down; upper plumage dark brown with fulvous cross bars and bold longitudinal central streaks of pale buff; below pale washy buff or whitish with white shafts, and mottled and barred, especially on flanks and sides of neck and breast, with bars of blackish and a little pale rufous.

Chick in First Full Plumage.—Like the female, but duller.

Distribution.—Practically the whole of Central and South Europe and all but the extreme north; Northern Africa and all North and Central Asia as far east as Lake Baikal. South through Arabia, Persia, Afghanistan, Baluchistan and North-West India, a few breeding birds being found as far east as Purnea, Mymensingh, Cachar and Manipur. South, eggs have been taken at Satara in the Bombay Deccan, and Hoshangabad in the Central Provinces. In the winter birds struggle as far south as Madras on the east, and right down to Travancore on the west. No absolutely authentic record of their being found in Ceylon exists, but it is quite possible that they may wander into that island occasionally. It has been recorded from several places in Burma, but these birds were probably the Eastern form, *Japonica.*

Nidification.—The Common Grey Quail no doubt remains with us to breed in far greater numbers than was formerly believed or is even now generally known. To some extent this is due to the fact that this bird was accepted as a migrant only and whenever eggs were found they were taken to be the eggs of the Rain Quail. Throughout the North-West from Sind, where Betham procured eggs, Gilgit (Cock), Kashmir, (Ward), as far East as Purnea (Hume) and South to the Deccan and Central Provinces the Grey Quail undoubtedly breeds regularly and, over the major portion of the area, abundantly, though its numbers seem to vary considerably from year to year, possibly affected by the rainfall. It, however, breeds further East than this as I have shot breeding females in Dacca and Mymensingh in June, though I failed to find the nest, and I have seen it in Cachar, though very rarely, in the same month.

In India, the breeding season seems to be principally March and April during which months eggs have been taken in Purnea (Hume), Lahore (Marshall), Naoshera (Cock), and in Multan and Lyallpur (Lindsey-Smith). They have been taken in May by Lindsey-Smith at Lyallpur, in Gilgit by Biddulph and in Kashmir by Ward. I have also one record of a clutch taken near Hoshangabad by a Mr. Jennings on the 19th September.

Other places at which eggs have been taken are in the Peshawur, Sialkot and Hansi districts of the Punjab, Dehra Dun, Saharanpur, Shahjehanpur, Fathigarh, Allahabad and Jhansi.

The nest, of course, is merely a hollow scratched in the ground, in open grass country, fields of crops or in patches of thin grass between cultivated fields. Sometimes, they lay actually in the fields of corn and then the eggs and young must be destroyed when the corn is cut in May but, for the most part, in India, they appear to prefer grasslands and green corps to grain-fields for breeding purposes. It has been noticed that the nest is generally placed in the vicinity of a tall patch of vegetation or a bush which probably acts as a landmark to assist the bird to find her nest.

Of nest in the true sense of the word, there is none. There may be a few scraps of grass and an odd leaf or two in the hollow though these are generally only accidental. Sometimes, however, quite a compact pad of grass and leaves is gathered together by the hen-bird as a bed for her eggs.

These, the eggs, in India vary very greatly in number. I have not known more than 10 in any clutch, whilst 6 or 7 is much more common, and less than these not rare. Major Lindsey-Smith sent me two clutches from Multan and Lyallpur numbering 3 or 4 only which were very far advanced in incubation, and, *in epistola*, he writes "they often seem to lay very small clutches here, 3 to 5 being quite common."

The eggs in colouration are of many types. Perhaps the most common has the ground colour a rather deep yellow-brown or reddish-brown, covered all over with minute specks of dark blackish-brown, with here and there a few rather larger blotches of the same, scattered about irregularly over the surface. Another type has the ground colour a pale creamy-white with blotches of almost black everywhere ; in some clutches these markings are numerous and not very big, in others they are few in number, but very large in size.

Other eggs have the ground a warmer buff and the markings of a deep chestnut. Another clutch in my series has the ground colour a very pale yellowish, and the markings consist of scant freckles and large blotches of pale reddish. Yet another type has the markings formed by irregular patches of liver brown, running into one another and very smeared and ill-defined. Between all these are many intermediate forms, but eggs of well-defined type are certainly in the majority. In shape the eggs are bluntly pyriform, a minority being almost oval. The shell is very hard and strong and has a good gloss when freshly laid, but this soon passes away.

50 Indian eggs, including Hume's eggs in the British Museum, average 30·7 × 22·7 mm. and the extremes, 33·0 × 23·0, 31·6 × 25, and 27·1×19·1 mm.

100 European eggs average 29·4 × 22·8 mm. (Hartert), so that there would not appear to be very much difference in size between Indian and other birds.

Although Quails are very pugnacious during the breeding season, generally a trait of polygamous birds, the males are almost certainly monogamous, except in captivity when one male will take on family cares with many females. When the hen is sitting, the cock apparently keeps close to the nest and accompanies her and the chicks when the latter are hatched. The hen is a very close sitter, especially when incubation is at all advanced and Hume records how he actually caught one on her nest and when replaced upon the eggs, which were on the point of hatching, she continued to sit on them and made no attempt to seek safety in flight.

Habits.—The Grey Quail is found in Winter throughout all India except in the extreme South, both in the plains and in the mountains and hills up to some 8,000 feet wherever the country is sufficiently open and there is cultivated ground, fields of grass or more or less barren ground with stunted growth of bushes or scattered patches of coarser grass. It is never found in evergreen forest, very seldom in deciduous forest unless it is very open and it does not even care for bush cover or secondary growth, though it may haunt these during the hottest hours of the day, both when it first arrives in India and before it leaves again at the end of April and May. Crops are undoubtedly its favourite cover and amongst crops those which bear ripe or semi-ripe grain and which are long enough to give it shade, yet not too dense to allow easy progress through the stems. It is very partial to fields of late winter rice in the West of Bengal, Behar, etc., but it will only be found in those which are quite dry underfoot and it never shares with the Snipe its beloved mud and slush. An odd bird or two may often, however, be found in the grass covered banks which separate one field from another, or in the higher, drier patches when the water has disappeared.

Quail appear on migration in India roughly on much the same dates as Snipe do, but whereas Snipe arrive earliest on the Eastern side of India, Quail arrive first on the Western side. Nor do their routes seem to be the same as those taken by Snipe. The first birds to arrive in Sind, Bombay and the Southern parts of North-West India apparently come almost due East through Arabia and Southern Persia across the Red Sea, after these have arrived and passed on South and East other flights come down from Central and Northern Asia direct across the highest passes in the Himalayas, both due South and again through Afghanistan and Baluchistan in a South-East direction. Few, if any birds seem to come over the Himalayas East of Nepal and the birds which arrive in Behar, Chota Nagpore, Western Bengal, etc., all seem to be working West to East. Their time of arrival is most irregular but almost invariably, as far as my records go, the birds first appear in Chota Nagpore, then in the driest Western parts of Behar and finally South and West into Western Bengal. The comparatively few birds which struggle into Eastern Bengal and Assam are always very late arrivals, few before November, and they are also the first to leave, few being seen after early March. Within India their movements are very irregular; according to Hume the majority of the earlier birds which arrive in August pass on at once well inland, South and East, but even these birds change their habits according to the season and, as Mr. J. Davidson points out, it is food supply which controls their movements. Given an ample supply of suitable grass seed, ripe grain or other food and the birds stay where they arrive, spreading out gradually over a wider and wider area, but sufficient food not being obtainable they at once pass on to better rationed districts, further South and further East.

When they arrive in India, they do so in smaller flocks than those in which they collect on their departure and flocks continue to arrive from early August to late October, indeed, as recorded by Hume some flocks do not arrive from due West until November and December. When they depart, however, they all seem to gradually work West from Bengal, Behar and Orissa and South from the Deccan, Mysore, Travancore and Bombay until by February and March, they have collected in enormous numbers in the Punjab, North-West Provinces and Northern Bombay. Finally the great majority clear out during April, a few non-breeding birds possibly staying until the first days of May.

The flocks in which they migrate North and West must sometimes number very many thousands, for Hume writes of one such flock seen by himself "one moonlight night, about the third week in April, standing on the top of Benog (7,500′), a few miles from Mussoorie, a dense cloud, many hundred yards in length and fifty in breadth, of small birds swept over with the sound of a rushing wind. They were not twenty yards above the level of the head and their unmistakable call was uttered by several of those nearest, as they passed."

They seem to migrate solely by night and as the Israelites did, so do we, find them ready for us in the morning, swarming in places where there was not a bird the evening before. Snipe, as everyone knows, commence their migration movements early in the evening, long before sunset, and often continue them long after sunrise, and every snipe-shot in India has seen these birds arriving at and leaving their grounds. Quail, however, seem to start after dark, and to stop to rest before light except, of course, in the rare instances when they are trapped by daylight at sea. On one of these occasions I was a fortunate witness of such a flight. Our steamer had arrived close to Bombay, and when I came on deck about six o'clock on an October morning, incredible numbers of Quail were passing the ship, flying, apparently, from the North-West. They were not, however, flying in masses, as seen by Hume, but in small and scattered parties, none containing more than a couple of hundred birds, but they continued to pass intermittently for at least ten hours, and it would be difficult to estimate the hundreds of thousand that must have passed in that time. Many came on board and just dropped down on the deck, so exhausted that they allowed themselves to be picked up, but a very short rest sufficed to renew their strength and they took wing and joined their comrades on their way East. At least 200 Quail must have fallen on board, but except a few which were caught by the crew and "halaled" the remainder were shown true hospitality and allowed to depart unscathed. A curious fact about these Quail was that none of them attempted to drink on board though plates and dishes of water were scattered about for their benefit. On other occasions I have known solitary Quail come on board ship in the Red Sea both in Spring and again in Autumn, but on no other occasion have I seen or heard them flighting in numbers.

In Eastern India, though the Quail may in many parts make a very valuable addition to the total day's bag, there are not many places where he forms the sole object of the sportsman, except for an odd hour or two in the mornings and evenings, but in North-West India very large bags are often made. Fifty couple to a single gun is nothing exceptional but I have no idea of what the actual record bag is though a hundred couple has often been exceeded.

The only Quail shooting I have personally had was in the Chota Nagpore District where 10 to 20 couple in addition to other game was considered quite a good day's bag. But, even if we did not obtain huge numbers of victims to our guns, few days of sport were more pleasant than some of those we had round about Hazaribagh. Early morning would see us a few miles out of the station with a dozen beaters and generally our first beat would be through some field of crops in the hopes of an odd jungle fowl or two and the practical certainty of a few quail. If luck was in our way, four or five of the latter would be picked up together with a jungle fowl or spur-fowl. tempted in the early morning out of the adjacent *sal* forest into the grain for a feed. Next we would wander across a stony, barren hill. turning out a hare on our way from a patch of ber bushes and grass. Down the side we would proceed to the bottom where a few rice fields would surely hold a couple of fan-tail snipe and, if the rough ground round about afforded good cover, an almost equal chance of pin-tail. lovers of drier ground and coarser cover than the fan-tails. Next a few hundred yards of scrub and *sal* would give the opportunity for the beaters to show what they were worth. Skirting the edge we would take up our position on the far side and await the advent of the beaters. First would come a couple of spur-fowl scurrying along with heads and tails depressed until they got to the very edge of the jungle when, with a mighty fluster of wings and cackling they would take flight, let us hope stopping to our shots as they rang out. A moment's interval and a mouse deer or hare might show up, or a jackal slink nervously past, fearing a shot might be wasted on him if he tarried too long. Possibly a jungle fowl or Black Partridge would also add to the number of the game-bag, or a flock of lovely Green Pigeon, disturbed from feasting on the figs of a banyan or pepul tree, would dash past us. Then more patches of grass and crops would give us a few more quail and so on through the morning until we felt we had well earned a rest and lunch. An hour or two for lunch and then home by a different route but over the same kind of country with much the same result, so that, if the fates were kind, two or three guns would arrive home with a bag of 20 couple of oddments, of which the greater number would be quail. Rarely we would get as much as 40 couple when both snipe and quail were well in, but more often I think, we were under rather than over 20 couple.

Quail are very game little birds and, though they do not fly far, they fly very fast and straight, indeed it is their extreme directness of flight which makes them easy shooting so that a man who gets one snipe in two shots on a long day should, after very little practice, get two out of three, or even three out of four, quail. On the other hand, they are rather disconcerting in the way they bob up almost at one's feet, fly fast in a bee-line away from you, just skimming along the tops of the crops and then, just as you think they are a fair shooting distance away, tumble headlong out of sight.

Hume thought the most pleasant way of shooting them was to do so from a machan in high crops.

" First you look out for the machan whence the people watch the crops to keep off the birds, which is almost always at one edge of the field, and where that abuts on some barren plot or bare field intended for the Spring crops. If this particular one is not so situated, you move on to one that is. Then you put your beaters—and they should be numerous and each have stick—in at the opposite side of the field. Then you ascend the 'machan', light a cigar, and, as the Walrus says to the Oysters, 'admire the view.'

" In the meantime the beaters, if they know their trade, will beat very slowly through the field in a more or less semi-circular order, the concavity towards the machan, not talking, but rustling vigorously about with their sticks at the bases of the dry stalks. Probably the first thing that distracts your attention from the surrounding scenery is a tremendous rush and a general hoorush (the best trained beaters are but men !), and, swiftly parting the waving stems, you see an old black buck coming at a headlong pace towards you, his nose straight in front of him, and his horns laid well back on his shoulders. You don't move (and even if you did, when he was close to you he would see nothing above him), but just as he emerges in the open, if not more than twenty-five yards distant, you roll him over with a buck shot or S.S.G. cartridge in the neck. If further and you have a rifle, it ought to come (though it sometimes don't) to the same thing. Then your Pathan, who has been crouching at the base of the machan, glides out and solemnly cuts that buck's throat in the name of the Almighty.

" The beaters have by this time repented of their enthusiasm ; they are dimly conscious that that 'hoorush' may not be viewed in a favourable light, and that it would be well for them if the 'Protector of the Poor' aloft (on the machan I mean) got a good many shots before they again interviewed him. As they advance, perhaps two or three greys, a whole brood of Pea-chicks, or possibly a black or two (I mean Partridges, shooting the other kind *est expressement defendu*), and almost certainly a hare or two make their appearance, the former skimming along about the level of the machan, lovely cross shots (some of course, but not many with well-trained beaters, out of range), the latter tippety tap, without the faintest conception of looking up, halting probably to listen with ears erect just outside the field, perhaps not five yards from the machan.

" And now the flank beaters have got down to the edge of the field where your station is, and the Quail begin to rise and whirr past, and nine out of ten birds will pass within shot if the thing has been properly managed. You are now in the warm corner, and the birds will rise much quicker than you can load and fire, unless you have a rule that at each shot every man halts and keeps perfectly still until you whistle. Even then, as the semi-circle contracts, the Quail whirr up in threes and fours, and many will get past without running the gauntlet of your fire.

" If, as often happens, there are a few scattered bushes here and there dotted over the fallow field, 5, 10, 15 yards away from the edge of the field, and you whistle a halt, get down and yourself walk through them, quietly, putting your foot into each, you will probably find that, despite the terrific fusilade you have been keeping up, almost every tiny patch contains one or more quails.

" I have thus occasionally killed over a dozen brace, besides other game, from one platform; but even if you get only five or six brace all told, there is 'a rapture of repose' about the arrangement, which I confess has always had many charms for me."

The more usual way to shoot these birds, however, is to walk them up in the crops. Quite a thin line of beaters, say one every 10 yards or so, is sufficient to get the birds up, and when they are plentiful it matters little if a few are walked over. In the North-West in March and April they often swarm to such an extent that it is impossible to fire at a tenth of the birds as they rise, and quite a small patch of rice, wheat or their favourite crop, millet, may afford ten to twenty couple of birds collected. Perhaps, indeed, it is harder to retrieve one's birds without dogs, than it is to knock them over, at the same time good native beaters are wonderfully good markers and, on the whole, only a small percentage of dead birds are lost. Even if one has dogs, they cannot be allowed to range after dropped birds, or the whole field is disturbed and many shots lost.

Fortunately Quail do not pack, and though they may get up very close to one another they all seem to act as individuals, not as coveys and, as a matter of fact, they do not go about in coveys at all as soon as the chicks are old enough to look after themselves. They do, however, nearly always keep in pairs, and in parts of India where they are more or less uncommon birds, where one is found the pair to it is sure to be somewhere near at hand.

Unfortunately for the Quail, the gunner is by no means his only or his worst enemy, for he is assiduously trapped by the natives wherever he is sufficiently numerous to make trapping pay for the time spent upon it. Sterndale's description of a Quail trapper nearly 100 years ago, still applies in every detail to many a trapper of the present day. He writes:—

> "It was on this trip I came across two queer specimens of humanity—a Quail-catcher and a snarer of Kingfishers.
>
> "The former I met on a wild upland, whither I had gone in search of a blue bull. He was a little shrivelled-up man in scanty

attire, with a bullock as dessicated in appearance as himself, a large flat basket to hold his birds, and a trap. I entered into conversation with him, and asked him if he could show me how he caught the birds, promising to buy all he could catch there and then. It was late in the year for Quail, which are generally found in greater abundance in the early part of the cold season, but there were a few fields of millet in the neighbourhood, and there was a chance of getting a few birds. After hunting about for a time, my friend flushed a covey,* and marked where they alighted ; then, making a detour he proceeded to set his traps which consisted of a series of rectangular frames, made of laths, about two feet long by one foot broad (a tightly stretched net occupying the interior of each frame) joined at the ends, and folding up like a long map. There were about a dozen of these frames and the centre one had an aperture in the net large enough to admit a Partridge.

"With a few bamboo pegs the trapper soon arranged his apparatus in the form of a semi-circular wall, and behind the hole in the centre frame he fastened a large net bag, propped up with a few sticks. This done, he ran back to the place from which he had started the birds, and began to work his bullock backwards and forwards, gradually, with each tack, nearing the hiding-place of the covey. Soon the little brown heads were to be seen popping up from the grass, and then, seeing that no immediate danger threatened, they edged off slowly, as the bullock came nearer and nearer. By a little judicious dodging, the trapper managed to get the birds within the sweep of his nets, and then he waited.

"The stupid little things toddled on and on, till they were stopped by the net, when they took off to the left, which was quite a wrong direction ; so my friend, by a flank movement, headed them again, and turned them back towards the centre of the net. Now and then a silly bird would try and poke his head through the meshes of the net covering the frames, but none thought of hopping over. At last the leader came to the hole in the centre. Ah ! here was a grand opportunity. In he hopped, and in popped all the others, and my dusky teacher in the art of snaring rushed forward with a triuphant whoop, and tied up the mouth of the bag with all the struggling Quail inside."

Then, too, they are netted by every tribe of the less civilized inhabitants of all parts of India, in great numbers ; Santhals, Mundas, Gonds and the North-West people all catch them in nets set up round the edges of heavy crops such as rahar, bajra, millet, etc. The birds are quietly driven up from one end to the other, running along the ground until nearly at the end, when a 'hurrush' starts them up and flying, as usual, as low as they can, they plunge into and are entangled in the nets, from which they are disentangled alive and placed in baskets, prior to being taken to market.

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* If this word is correctly used, then the particular birds operated on in this instance must, surely, have been Bush Quail. Grey Quail never, I believe, go in coveys in India.—A. O. H.

Inglis gives a very interesting account of Quail snaring in this Journal (XXVII, p. 947). He writes :—

> "In this District, Dharbanga, Quail are snared by several castes of people, but principally by the mallahs (fishermen), and it is only some of them who go in for it. The birds caught are practically all the Common or Grey Quail (*Coturnix communis*) with very occasionally a Rain or Black-breasted (*Coturnix coromandelica*) one or else the Little Button Quail (*Turnix dussumieri*); although the Indian Button Quail (*Turnix t. tanki*) is also got here, I have had none brought to me by these men. The following is the proportion of each species, out of a total of 128 brought to me by the snarers up to the time of writting :—Grey Quail 120, Black-breasted Quail 1 and Little Button Quail 7.
>
> "In the paddy stubble, and where the Khesari (*Lathyrus sativus*) is small, the snarer only goes after the quail in the early morning and in the evening as these are their feeding times, and the birds move about freely then ; but where the Khesari or gram (*Cicer arieinum*) is higher, he snares till later in the morning, as there the cover is shadier and the birds will scuttle about a bit and are not so frightened of birds of prey as they are in the thinner cover in the late morning.
>
> "On reaching the spot he intends to work, the catcher first of all takes a sheet and rolls up two corners of it for about six inches, these he ties with a piece of straw or grass to keep them from unrolling ; the rolled up corners are meant to represent a cow's horns ; then he gets two thinnish pieces of bamboo about two feet seven inches long, and about five inches from the ends he ties them together crossways ; the long ends are inserted into the ' horns ' and the short ones rest against his chest ; the sheet is thrown over his head and down his back reaching to his ankles and the end with the horns sticks out like a canopy in front of his head ; he ties the sheet round his neck and this keeps the canopy taut; the rest of the sheet is wrapped round his body.
>
> "The net he uses is made of six strands of cotton twisted into thread and is six feet long by two feet seven inches broad, and its mesh has a diameter of about an inch ; it is weighted with baked clay fillets along one side of its length and at the ends of the opposite side a couple of pointed sticks, about eighteen inches long, are tied ; another stick of about the same length being fastened midway between these two.

> "This net is slung over his shoulder and he draws the sheet round him, covering his arms. He is now ready and the sport begins. With the cloth well wrapped round his body, the snarer stalks, with short steps and very slowly, through the field, every now and then bowing so as to imitate the motion of a cow's head. When a quail is seen he heads it off, and at a short distance in front of it fixes his net, the weighted end lying flat on the ground, the opposite side being raised about one foot in the middle and rather lower at the sides, and kept in this position by the three sticks; this open side is set facing the direction in which the quail is to be driven. The man now circles round the bird so as to get behind it and then the driving commences. Now he moves slowly forward, now sideways, bowing at intervals and very quietly working the quail towards the net. If the bird appears rather wild, he slowly assumes a crouching position and crawls along with his head towards the ground to represent a cow grazing; in this way he guides the quail to the net. Should the quail be fairly tame he does not require to crouch, but can work the bird into the net in an erect position. When under the net the quail tries to burst headlong through the meshes instead of running to the side where it could easily escape as the net does not drop. As soon as the snarer sees the bird is inside he rushes forward and captures it and ties it up in his loin cloth. Should the bird pass by the net, it is headed back again, or else the catcher takes up the net and fixes it in another position. It is wonderful seeing the quail being worked up to the net, this being done in a most skilful manner. Occasionally more than one bird is captured at a time, but as a rule the snarer contents himself with working one, unless several keep well together. The birds seldom seem to rise, except in newly worked fields where no cattle are grazed, and if one does fly off the catcher does not as a rule follow it up unless birds are scarce. While stalking the men have a most weird and ghost-like appearance."

But not only is the Quail shot and trapped, it also forms a quarry for some of the humbler forms of hawking. Probably, now-a-days this form of sport has almost disappeared, but Tickell met with it in Singhbhum. The hawking was done with the Indian Sparrow Hawk or the Shikra, and the hawk was held in the hand and hurled in the direction of the escaping Quail instead of being cast off as a falcon is.

The days have gone, alas, when 100 quail could be bought for Re. 1 to Rs. 2/8 as Hume says, but even now a good many can be purchased for one rupee and it would be difficult to imagine a more delicate or savoury meal than a few pence worth of fat quails on toast. Certainly they are more dry in flesh than are snipe but even so they are exceedingly good for the table.

As in Hume's time, so now-a-days, for the most part the birds hawked about for sale are females, but where they are very plentiful both sexes alike are sold, merely a few of the presumably finest males being picked out and kept for fighting purposes. They are most pugnacious birds and the Mahomedans take an enormous interest in Quail-fighting, wagering large sums on well-known birds and paying very high prices for the best. Even in Behar, I have known fifty rupees paid for a local champion, and in the North-West and Deccan it is said even higher prices are paid.

The usual note of the Grey Quail is the loud whistle of the male from which it received one of its later (and therefore not used) names of *dactylisonans*. It consists of one long, loud whistle, rapidly followed by two short notes. They have, however, many other notes, a soft purring call of one sex to the other, a sharp alarm note often uttered as the birds are first flushed and common to both male and female, a soft chirping whistle uttered by the birds conversationally, and finally a soft 'chick chick' uttered by the hen to her chicks when they wander too far away from her.

The food of the Quail consists of both grain and insects, but grass seeds probably form its staple article of diet. It is said also to eat green shoots of mustard and other crops.

COTURNIX COTURNIX JAPONICA.

The Japanese Grey Quail.

Coturnix vulgaris japonica Temm. and Schleg., Faun. Jap., p. 103, pl. 61, (1842).

Coturnix japonica Cass. in Perrys. Exp. Jap. II, p. 227, (1856), (Hakodati Japan); Grant, Ann. and Mag. Nat. Hist. (6), X, pp. 167, 170, 171, (1892), (wood cut of head); Grant, Cat. Birds, B. M., XXII, p. 239, (1893); id., Handb. Game-B., 1, p. 184, (1895), (part); Oates, Man. Game-B., 1, p. 87, (1898), Finn. Ibis, 1899, p. 472, (Manipur); Rippon, ibid, 1901, p. 556, (S. Shan States); Mears, Jour. B.N.H. S., XVII, p. 87, (1907), (Chindwin); Harington, ibid, XIX, p. 310, (1909), (Bhamo); id, ibid, XX, p. 377, (1910), (Bhamo).

Coturnix coturnix japonica Hartert, Vog. Pal. Faun., III, p. 1943; id., Nov. Zool., XXIV, p. 425, (1917), (part).

Vernacular Names.—*Gnon* (Burmese).

Description—Adult Male.—Differs from the male of *C. c. coturnix* in having no black on the chin and throat and no cross bars, these parts and the sides of the head being light brick red; the general plumage is often richer in tone and more boldly marked than it is in the European bird but the variation is great in both the Eastern and the Western form. The feathers of the side of the chin are often lengthened and pointed, though not to the extent that they are in the female.

Colours of Soft Parts.—As in the preceding bird.

Measurements.—Wing 91 (in one instance) and 95 to 104 mm.

Female.—Differs from the female of the Western form in having the feathers of the chin and sides of the lower cheeks stiff, lengthened and pointed, forming a regular little beard. Like the male it is also generally, but by no means always, more richly coloured.

Measurements.—Wing 97 to 103 mm.

Distribution.—This little Quail apparently breeds in Eastern Siberia, East of Lake Baikal, but more commonly in the extreme East and in Japan. In Winter it is found South throughout Southern China, Yunnan, Shan States, Siam and Cochin China whence it straggles into Burma from Tenasserim to the Chin and Kachin Hills, Manipur and Assam South of the Brahmaputra. The Bhutan specimen in the British Museum given this name appears to me to be only the common Western form, and I can find no other specimen in the British Museum from India. I obtained it twice in Cachar and Finn records it from Manipur where it was shot by Capt. Turner. Nisbett, Harington and others record it as quite common in the Shan States and Kachin Hills.

Nidification.—The Japanese Quail breeds in very large numbers in Japan from the end of May to the end of June and the first few days of July and I received a very fine series of eggs from the late Alan Ouston. According to that gentleman, it as a rule makes no nest, merely laying its eggs in a hollow in the ground where it collects a few odd leaves and scraps of grass. The hollow used may be either a natural one or one made, or enlarged, by the birds themselves, more often than not, however, a natural hollow is used by these birds, just rounded off to fit their bodies. Occasionally the Japanese Quail does make quite a decent nest, collecting a good pad of grass which it tramples and twists into a compact pad.

The site selected is either in a field of some kind of crop, or in thin grass land, or even an almost bare hillside under the shelter of a coarse tuft of grass or small bush.

The eggs go through all the same variations as those of the common Quail, and further description is quite unnecessary. Eighty eggs, which include those noted by Hartert, average 28·7 × 22·4 mm. The extremes are: maxima, 32·6 × 22·4 and 30·5 × 23·6 mm.; minima, 26·2 × 22·1 and 27·2 × 20.5 mm.

Habits.—The habits of the Japanese Quail do not differ much from those of the Common Quail but, so far, there has been no evidence to show that this bird is ever non-migratory in its habits or ever breeds in its Winter resorts. It is said to have a quite different voice from that of its cousin. Prjevalsky remarks :—

> " This bird is easily distinguished from the European one by its voice. We found it in South-East Mongolia, Ordos, Kansu, and about Koko-nor breeding, sometimes numerously, and others abundantly ; and from the end of March to the middle of Summer the call notes of the males can be heard daily, consisting of some

> deep, hollow sounds, several times repeated in quick succession. In the Yellow-River Valley they winter in great numbers, and sometimes, stop for the cold season also in South-East Mongolia. In Kansu they occur in the Steppes, but avoid the narrow mountain valleys. We found it common in the Ussuri country, where it principally keeps to the Plains and Steppes. It arrives there in Spring, about the end of March or early in April, and leaves again about September or October; a few, however, remain here to winter. The spring call-notes of the males is to be heard until the middle of August; and the first young were found by us on the 29th May."

In China the Japanese Quail often forms the object of shoots among the residents of the various European settlements from October to March, but nowhere, as far as I can learn, are they ever obtained in the huge numbers in which the Common Quail are sometimes bagged in North and North-West India.

COTURNIX COROMANDELICA.

The Black-breasted or Rain Quail.

Coromandel Quail Lath., Gen. Syn., II, pt. II, p. 789, (1783).

Tetrao coromandelicus Gmel., Syst. Nat., 1, pt. II, p. 764, (1788).

Perdix coromandelica Lath., Ind. Orn., II, p. 654, (1790).

Coturnix coromandelica Bonnat., Tabl. Encycl. Meth., I, p. 221, (1791), Gould, B. of Asia, VII, pl. 9 (1854); Adams, P.Z.S., 1858, p. 504; Irby, Ibis, 1861, p. 237, (Oudh, Kumaon); Jerdon, B. of India, III, p. 588, (1863); Hume, Str. Feath., I, p. 227, (1873), (Sindh); Adam, ibid, I, p. 393, (1873), (Sambhur Lake); Hume, Nests and Eggs, Ind. B., p. 550, (1873); Hume, S.F., III, p. 178, (1875), (Pegu); Ball, ibid, III, p. 294, (1875), (Chota Nagpur); Le Mess., ibid, III, p. 379, (1875), (Sindh); Butler, ibid, IV, pp. 7, 39, (1876), (Mt. Aboo, N. Guzerat); Fairb., ibid, IV, p. 262, (1876), (Deccan); Davidson and Wendon, ibid, VII, p. 87, (1878), (Deccan); Ball, ibid, VII, p. 226, (1878), (Ganges to Godaveri); Cripps, ibid, vii, p. 298, (1878), (Faridpur); Butler, Cat. B. Sind., etc., p. 55, (1879); Hume and Marshall, Game B., Ind., II, p. 152, (1879); Vidal, S. F., IX, p. 76, (1880), (S. Konkan); Butler, ibid, IX, p. 423, (1880); Butler, Cat. B. S. Bombay, p. 70, (1880); Reid, S.F., X, p. 63, (1881), (Lucknow); Oates, ibid, X, p. 236, (1882), Thayetmyo and Bassein, Davidson, ibid, X, p. 411, (1883), (Nilghiris, Wynaad, Mysore); Oates, B. Burmah, II, p. 333, (1883); Swinh. and Barnes, Ibis, 1885, p. 132, (Central India); Hume, S.F., XI, p. 310, (1888), (Assam, Chittagong, Manipur); Oates, ed. Hume's Nests and Eggs, Ind. Birds, III, p. 444, (1890); Ogilvie-Grant, Ann. Mag. Nat. Hist., (6), IX, pp. 168, 172, (1892); id., Cat. Birds, B. M. XXII, p. 241, (1893); id., Hand-L. Game Birds, 1, p. 185, (1895);

Blanford, Faun. Brit. Ind., IV, p. 116, (1898); Oates, Man. Game B., I, p. 90, (1898); Oates, Cat. Eggs, B.M., 1, p. 45, (1901); Rippon, Ibis, 1901, p. 556, (1901), (S. Shan States); Jesse, ibid, 1903, p. 153, (Lucknow); Macdonald, Jour. B.N.H.S., XVII, p. 496, (1906), (Myingyan); Whitehead, Ibis, 1909, p. 268, (Kohat); Osmaston, Jour. B.N.H.S., XXII, p. 544, (1913), (Gorakpur); Currie, ibid, XXIV, p. 574, (1916), (Lahore); Whistler, Jour. B.N.H.S., XXVI, p. 594, (1919) (Ludhiana); Inglis, ibid, XXVII, p. 154, (1920), (Jalpaiguri); id, ibid, p. 947, (Behar) (1921).

Coturnix textilis Temm., Pig. et Gall., III, pp. 512, 742, (1815); Stephen, in Shaw's Gen. Zool., XI, p. 365, (1819); Lesson, Traité d'Orn., p. 509, pl. 90, fig. 1, (1831); Sykes, P.Z.S., 1832, p. 152, (Deccan).

Perdix textilis Temm., Pl. Color., V., pl. 40, (No. 35), (1824).

Perdix olivacea Buchan., P.Z.S., 1831, p. 123, (India).

Coturnix textilis ? v. *pluvialis*, Hodgs., In Gray's Zool. Misc., p. 85, (1844).

Coturnix coromandelicus, Blyth and Walden, Cat. Mamm. and Birds, Burmah, p. 151, (1875), (Upper Burmah).

Vernacular Names.—As a rule this quail is not distinguished by natives from the Common Rain Quail. A few additional names are, *China Butteyr*, (Upper India); *Chanac*, (Nepal); *Kade*, (Tamil); *Chinnayellichi*, (Telegu); *Ngön*, (Burmese); *Chinnung Buttêr*, (Lucknow).

Description—Adult Male.—The upper plumage, including the wing coverts and tail are the same as in the Common Grey Quail, but almost invariably much richer and deeper in colour though in this respect the two birds overlap one another; the primaries and outer secondaries are brown, edged paler *but without any bars;* below the chin and throat are marked as in the Common Quail, but the throat and bars, especially the line under the eye are a deeper black, and the intervening spaces are a pure white, not pale fulvous; the centre of the breast and upper abdomen are black and the flanks are fulvous with broad bold streaks of velvety black. Altogether it is decidedly a handsomer bird than its larger relation.

Colours of Soft Parts.—Iris bright hazel to deep brown; bill black in the breeding season, more dusky and paler at the base in the non-breeding season and in young birds; legs and feet fleshy or fleshy-grey, more reddish fleshy in the breeding season.

Measurements.—Total length about 180 mm. or less; wing 83 to 92 mm.; tail about 30 to 32 mm.; tarsus 25 to 26 mm.; culmen about 13 mm.

Female.—Practically indistinguishable from the Grey Quail, except by the unbarred primaries and smaller size. As a rule, however, it is more richly coloured with more black and rufous on the upper plumage.

Measurements.—Wing 85 to 94 mm.; culmen 11 to 12 mm.

Chick in Down. and *Young Birds* are indistinguishable from those of the same age of *C. c. coturnix.*

Distribution.—The whole of India in suitable localities from Ceylon, where however it is very rare, to the extreme North-West and North-East. It is quite a common bird in Sind, has been procured by Whistler in Ludhiana and by Dodsworth near Simla. East it extends all through Assam from West to East and from North to South, though numerous nowhere ; thence it is found practically throughout Burma from the Chin and Kachin Hills to Pegu and East again to the Shan States.

Nidification.—The Rain Quail appears to breed almost wherever found ; with the exception, perhaps, of the higher hills. As its name infers, it breeds principally in the Rains after the big Monsoon breaks, *i.e.*, from the end of June on to the end of September and well into October, undoubtedly, however, the month of August and the early part of September form the main egg-laying season. Occasionally the Rain Quail breeds earlier ; thus I have a clutch of eggs taken by Harington Bulkley on the 4th April, and again in Cachar I found eggs just hatching on the 15th of that month but in the latter district the "Chota Barsat," or Little Rains, make things very green and damp in wet years at about that time. The Black-breasted Quails select as a site for their nests either standing crops or thin grass, preferably the former but will also sometimes lay in scanty scrub or low bush jungle and, still more rarely, almost in the open under a bush, a clump of cactus or a few tufts of grass. Like the Common Quail, the present bird sometimes uses a natural hollow for its nest or, at other times, scratches one for herself. The nest may be nothing at all beyond the bare earth, or it may be a few odd pieces of grass and a few leaves or even a fairly well put together pad of the same. The eggs vary greatly in number. Four to six are often found hard set, and they lay up to as many as nine or rarely eleven. Occasionally, nests are found with as many as seventeen or eighteen eggs, but these are certainly the product of more than one bird, shewing this clearly by the difference in type from one another.

No further description of the eggs than that already given for the preceding species is needed and the eggs of this bird vary equally as greatly as the eggs of that bird do, the only difference being their smaller size.

100 eggs average 27·4 × 20 8 mm., and the extremes are : maxima, 30·8 × 21·7 and 30·8 × 22·2 mm.; minima, 25·5 × 20·8 and 26·9 × 19·2 mm.

This Quail is undoubtedly monogamous, the cock-bird keeping close to the hen whilst she is sitting and if he wanders away a short distance when feeding he keeps on calling to her as much as to say he has no intention of deserting her altogether. He also assists her to feed and watch the young after they are hatched but apparently does not assist in the actual incubation of the eggs. The hen is a very close sitter, often sitting until almost trodden on, or, if discovered, remaining squatted on her eggs until the hand is within a few inches of her.

Davidson remarks on the very large percentage of the eggs of this bird which are destroyed by vermin, and this not only in regard to those nests which he had discovered and left, but also to eggs not previously found until they were seen by him lying broken and scattered about. Davidson suspected the Common Crow Pheasant and a large lizard of being the culprit, but birds in India have many foes to contend with, both amongst their own order and from outside. Crows of almost all kinds, Treepies and some Owls are all arrant egg thieves ; snakes make oölogy their special study, and rats and mice are equally destructive.

The cock Rain Quail during the breeding season, although he is content with one wife, is very combative and, according to Reid, the natives of Lucknow place his fighting qualities above those of his larger cousin, the Common Quail.

Habits.—The Rain Quail is certainly resident over the greater part of the area he occupies but he is generally believed to be locally migratory in many of the parts into which he comes during the breeding season. Thus Hume says " the majority are only seasonal residents, spending the drier months of the year in the low-lying and moist tracts of Lower Bengal and other Provinces and the monsoon in the higher, drier regions of Upper and Western India". Reid says that it is not found in Lucknow until the rains commence and it is not until this season that observers have recorded anything but a few casual birds in the Punjab and North-West Provinces, Cutch, Sind, Katiawar, the United Provinces and Rajputana.

In Behar I understand they are to be found all the year round *if* one knows where to look for them, as during the driest months they seek shady cover of some kind ; either reeds and long grass, bush or even tree jungle and the cover which is always to be found in Mango and other orchards round villages. Nowhere, however, is there any record of this bird being more numerous in the driest months than it is in the wetter ones, and it seems possible that the migrations are very local and consist merely of short journeys to the nearest dense cover, and especially to quarters where a little water is available.

In Bengal I never found them more common in the dry months than in the rains, and in Assam they were equally rare in Winter or Summer.

Davidson has probably correctly explained what takes place.

> "The Rain Quail is very common in the Deccan, and is a permanent resident, though it wanders about a good deal in search of water, food and shelter. Thus, while in November or December this Quail will be found scattered about singly or in

> pairs everywhere, in the hot weather hundreds will be found collected in a few nallas and gardens, and the most careful beating will fail to flush a single bird elsewhere for miles and miles. Moreover, it deserts its most favourite haunts at once if food begins to run short. In 1876, when the rains failed in Sholapur, and the ground was as bleak and uncultivated as in the hot weather, I never saw a single bird. Nor did they return till about June, 1877.
>
> "In Túmkúr, Mysore, in the middle of November, they simply swarmed. They were then in pairs and commenced calling hours before daylight, and in one camp positively kept me awake from four in the morning. I was very busy, and had no time to look for nests; but I never started any young ones. They afterwards collected in the scrub jungle, some of the flocks were very large, and they were still there in the middle of May. During June and July before leaving Mysore, I was working in a jungle country, so can hardly say whether they migrated or not, but I certainly never saw one in these months."

They are typically plains birds, but they wander up to considerable height, having been killed at 8,000 feet in the Simla Hills, and also as high in the Nilgiris. In Travancore they are common between two and four thousand feet, and in Nepal and the outer Himalayas they certainly breed up to nearly 6,000 feet.

They are not gregarious, though the two old birds remain with their young until the latter are about eight months old, when they are driven off and scatter into twos and threes. Where numerous, as in the Deccan, and parts of Central India, Mysore, etc., many birds may be flushed from the same field of crops, but they rise singly, or in twos, and never in coveys once the young have left their parents.

They are essentially birds of open country, cultivation and grass plains and plateaus, though, as already suggested, they may take to scrub or even heavier cover during the dry season. They are often found in compounds and gardens and very commonly in the semi-cultivated semi-bare areas round villages. In such places they are very tame and confiding but away from villages and towns they behave much in the same manner as does the Common Quail. No one seems to have made this bird a definite object of sport, though a few are nearly always shot during Quail shoots as they haunt the same crops and grass lands as the Common Quail does and, on the wing, one cannot be distinguished from the other. The flight of the two birds is identical, equally direct and swift and each ending in the headlong dive into cover after some 50 yards or so have been traversed.

The notes of the two birds are, however, quite dissimilar, that of this bird being a rapidly repeated and musical "whit-whit-whit-whit," uttered principally in the mornings and evenings but in July and August almost throughout the day.

A HAND-LIST OF THE SNAKES OF THE INDIAN EMPIRE.

By

F. Wall, C.M.G., C.M.Z.S., F.L.S., F.A.S.B., H.C.Z.S.I.,
Colonel, I.M.S.

Part II.

(*Continued from page* 361 *of this volume.*)

Family.—COLUBRIDÆ.

Subfamily.—Acrochordiinæ.

Genus.—Chersydrus *Cuvier.*

72. (443) **Chersydrus granulatus** (Schneider). *The Rasp-skinned Water Snake.*

Annandale, J.A. S., Beng., 1905, *p* 175; *Mem. Ind. Mus.* 1915, *p* 169, *Boulenger, Cat. Vol. I,* 1893, *p* 174 ; *l. c. Vol. III,* 1896, *p* 597 ; *Ferguson, Bomb. N. H. J. Vol. XIV, p* 386; *Sarasin, Zool. Jahr. Jena.* 1910, *p* 131; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 45; *Wall, Bomb. N. H. J. Vol. XXIII, p* 372 ; *l. c. Vol. XXV, p* 756*a* ; *l. c. Vol. XXVI, pp* 583 *and* 584; *Oph. Tap.* 1921, *p* 79.

Length.—1,220 mm. (4 feet).

Distn.—*Coasts of India.* From Bombay on the Malabar Coast, and Hijili (Ind. Mus.) on the Coromandel Coast to Tuticorin. *Ceylon. Coast of Burma. Andamans. Coasts of Malay Peninsula to Cochin-China. Malay Archipelago. Papuasia.*

Genus.—Stoliczkaia *Jerdon.*

73. (442) **Stoliczkaia khasiensis** Jerdon. *Stoliczka's Snake.*

Annandale, J. A. S. Beng. 1904, *p* 209; *Boulenger, Cat. Vol. I,* 1893, *p* 176.

Length.—809 mm. (2 feet, $7\frac{7}{8}$ inches).

Lepid.—Frontal partially divided anteriorly by mesial suture. Postoculars 3. Supralabials 8 ; the 4th and 5th touching the eye on the left side, 5th and 6th on the right[*]. Costals, 31 to 33 about midbody. (In the "type" I count 31 about midbody). Ventrals. 209 to 210. Subcaudals. 115 to 117.

Distn.—*Assam.* Khasi Hills. (Nr. Shillong. Ind Mus.)

Subfamily.—COLUBRINÆ.

Genus.—Polyodontophis *Boulenger.*

74. (363) **Polyodontophis collaris** (Gray). *Gray's Polyodont.*

Annandale, Rec. Ind. Mus. 1912, *pp* 37, 46 *and* 53 ; *Boulenger, Cat. Vol. I,* 1893, *p* 184; *l. c. Vol. III,* 1896, *p* 597; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 17; *Wall. Bomb. N. H. J. Vol. XVIII, p* 315 , *l. c. Vol. XIX, pp* 340 *and* 757*a.*

Distn.—*Western Himalayas.* As far West as Simla. *Eastern Himalayas.* As far East as Sikkim. *Bengal.* Calcutta. (Ind. Mus.) *Assam.* Hills North and South of the Bramaputra. *Burma.* As far North as Sima. (Lat. 25·2° Long. 97° Bombay colln.) South to Arakan Hills and Pegu Yomas. *Siam.* North of Kra (Malcolm Smith). *China.* Yunnan. Ichang. Fokien Prov. *Formosa.*

Note.—Improbable as Calcutta may appear for this hill species, I have it on Dr. Annandale's authority that an example was indubitably acquired there, which I have examined. It was probably washed down by floods.

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[*] In the specimen in the Indian Museum.

75. (364) **Polyodontophis subpunctatus** (Dumeril and Bibron). *Jerdon's Polyodont.*

Oligodon subpunctatus. *Vidal, Bomb. N. H. J. Vol. I, p* 144.
Polyodontophis subpunctatus. *Abercromby, Sn. of Ceylon.* 1910, *p* 71; *Boulenger, Cat. Vol. I,* 1893, *p* 186; *l. c. Vol. III,* 1896, *p* 598; *Ferguson, Bomb. N. H. J. Vol. X, p* 71; *Sarasin, Zool. Jahr. Jena.* 1910, *p* 130; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 17 (*part, All except No* 7073); *Wall, Bomb. N. H. J. Vol. XVI, p* 297; *l. c. Vol. XVII, p* 823; *Spol. Zeylan.* 1921, *pp* 397 *and* 406; *Oph. Tap.* 1921, *p* 84; *Willey, Spol. Zeylan.* 1906, *p* 233.

Lepid.—Ventrals. 151 to 214.

Distn.—*Ceylon. Peninsular India.* South of Rajputana, and South of the Ganges Valley.

Note.—In the Bombay Natural History Journal (Vol. XVII, p 823) I referred to a specimen, that appeared to unite the characters of *subpunctatus* and *sagittarius,* and which suggested the union of the two species under the latter and older name. I am now in a position to show that the two species previously held as such are both valid, and that the specimen referred to is an aberrant *subpunctatus.* This view is based on skulls in my collection. The dentition is as follows:—*subpunctatus.* Maxillary 44 to 45. Palatine 23 to 24. Pterygoid 21. Mandibular 40.—*sagittarius.* Maxillary 32. Palatine 14 to 16. Pterygoid 13. Mandibular 30.

The specimen referred to was probably from the Northern part of the Western Ghats as it was preserved in the same bottle as a *Lycodon flavomaculatus,* which has a very restricted distribution (*q. v.*)

76. (365) **Polyodontophis sagittarius** (Cantor.) *Cantor's Polyodont.*

P. subpunctatus. *Sclater, List. Sn. Ind. Mus.* 1891, *p* 17 (*part No* 7073).

P. sagittarius. *Annandale, J. A. S., Beng.,* 1905, *p* 175; *Boulenger, Cat. Vol. I,* 1893, *p* 187; *l. c. Vol. III,* 1896, *p* 598; *Sarasin, Zool. Jahr. Jena.* 1910, *p* 146; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 17; *Wall, Bomb. N. H. J. Vol. XVII, p* 823.

Length.—292 mm. (11¼ inches).

Lepid.—Ventrals. 205 to 236. Subcaudals. 54 to 70.

Distn.—*Western Himalayas.* As far West as Chamba. Sewaliks, North of Saharanpore. (F. W.) Dhikala, Garhwal Dist. Melaghat, Almora Dist. (Ind. Mus.). *The Ganges Basin.* Nowgong, C. P. Darbhanga. Purnea. Dinajpore. (Ind. Mus.). Bettiah, Behar. (Bombay colln.) *Lower Bengal.* Manbhum. Chaibasa. Serampore. Calcutta. (Ind. Mus.)

Note.—Penang as a locality calls for confirmation. The note appended to *Typhlops bothriorhynchus* shows that some of Cantor's localities are open to doubt. De Roepstorff's specimen in the Indian Museum, labelled Nicobars, is undoubtedly correctly identified. I feel justified however in raising the strongest doubt as to the authenticity of the locality for this species. The fact that de Roepstorff is also alone responsible for the Nicobars as a locality for *Oligodon sublineatus,* and *Amblycephalus monticola* strengthens the justification for doubt. Both *Polyodontophis sagittarius,* and *Amblycephalus monticola* are known from Northern India, but not from Assam or Burma, and the record of the Nicobars for the species must have perplexed other herpetologists as much as it has done me. *Oligodon sublineatus* known only from Ceylon with the exception of de Roepstorff's record from the Nicobars, is equally surprising.

Nearly every keen herpetologist has snakes sent to him by friends from distant parts of the Empire, and it is not surprising if these exotics sometimes get mixed with those collected from the locality where he is domiciled. In these cases the common species with which he is familiar are probably discarded and only the uncommon species retained. If all the species so acquired were retained the mixing would probably be discovered by future herpetologists at once.

77. (366) **Polyodontophis bistrigatus** (Günther) *Günther's. Polyodont.*

Annandale, J. A. S., Beng., 1905, *p* 175 ; *Boulenger, Cat. Vol. I,* 1893, *p* 188 ; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 18.

Distn.—Burma. Prome. Pegu. *Nicobars.*

Note.—De Roepstorff's specimen labelled Nicobars is correctly identified, but the doubts I have raised in the note appended to *P. sagittarius* makes confirmation of the Nicobars as a locality desirable.

Genus.—XENOCHROPHIS *Günther.*

78. (441) **Xenochrophis cerasogaster** (Cantor.) *The Painted Keelback.*

Boulenger, Cat. Vol, I, 1893, *p* 191 ; *Sarasin, Zool. Jahr. Jena.* 1910, *p* 146 ; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 45 ; *Wall, Bomb. N. H. J. Vol. XVIII, p* 104.

Length.—775 mm. (2 feet, 6½ inches).

Lepid.—Ventrals. 140 to 154.

Distn.—Ganges Valley. Fyzabad (F. W.) Bengal. Purnea. (Ind. Mus.) *Assam.* Goalpara. (Ind. Mus.) Khasi Hills. (Brit. Mus.)

Note.—Penang on the authority of Cantor I doubt for reasons cited in the note appended to *Typhlops bothriorhynchus.*

Genus.—NATRIX *Laurenti.*

1768. Natrix. *Laurenti, Syn. Rept. p* 73 [*type N. vulgaris* = *Natrix natrix* (*Linné*).]
1826. Tropidonotus. *Boie., part, Isis. p* 205 [*type N. natrix* (*Linné*).]
1842. Leptophis. *Holbrook, N. Am. Herp. IV, p* 21, *pl IV* [*type ? L. sauritus* = *N. saurita* (*Linné*).]
1853. Eutainia. *Baird & Girard,* [*type E. saurita*=*N. saurita* (*Linné*).]
1858. Coronella. (*non Laurenti,* 1768) *Günther, Cat. p* 39.
1860. Thamnophis. *Cope, Proc. Ac. Philad, p* 369 (*type N. scalaris*).
1861. Mizodon. *Peters, Mon. Berl. Acad.,p* 358 (*type N. variegatus*).
1863. Styporhynchus. *Peters, Mon. Berl. Ac., p* 399 (*type N. truncatus*).
1875. Chilopoma. *Cope, Wheeler's Rep. V. S. Ex. Surv., p* 544 (*type N. rufopunctatus*).
1877. Katophis. *Macleay, Proc. Linn. Soc. N. S. Wales II, p* 36 (*type N. picturatus*).
1883. Atomarchus. *Cope, Amer. Nat., p* 1300 (*type N. multimaculatus*).
1893. Prymnomiodon. (*non Cope,* 1860). *Boulenger, Cat. Vol. I,* 1893, *p* 192.

79. (*Nil.*) **Natrix pealI** (Sclater.) *Peal's Keelback.*

Boulenger, Cat. Vol. I, 1893, *p* 214 ; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 41.

Types.—In the Indian Museum. From Assam.

Distn.—Assam. Sibsagar.

80. (427) **Natrix parallelus** (Boulenger.) *Anderson's Keelback.*

Boulenger, Cat. Vol. I, 1893, *p* 223; *Rec. Ind. Mus.* 1913, *p* 337 ; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 37 ; *Wall, Bomb. N. H. J. Vol. XVIII, p* 223 ; *l.c. Vol. XIX, p* 340.

Length.—712 mm. (2 feet, 4 inches).

Lepid.—Ventrals. 162 to 175. Subcaudals. 73 to 110.

Distn.—*Eastern Himalayas.* Nepal to Sikkim. *Assam.* Khasi Hills. *Burma.* Sanda. *China.* Yunnan.

Note.—The locality of No 4397 of Sclater's list of snakes in the Indian Museum reported as "Madras Hills" by Colonel Beddome is to be discredited. The same authority records also *Tropidonotus subminiatus, T. himalayanus, Oligodon splendidus, O. octolineatus, Dendrelaphis caudolineatus,* and *Lycodon jara,* from Hills in South India. These records are equally untrustworthy as regards habitat.

81. (425) **Natrix khasiensis** (Boulenger.) *The Assam Keelback.*

Annandale, J. A. S., Beng., 1905, *p* 210 ; *Rec. Ind. Mus.* 1912, *pp* 37, 49 *and* 53 ; *Boulenger, Cat. Vol. I,* 1893, *p* 223 ; *Wall, Bomb. N. H. J. Vol. XVIII, p* 317.

Length.—673 mm. (2 feet, 2⅝ inches).

Lepid.—Ventrals. 143 to 155. Subcaudals. 73 to 100.

Distn.—*Assam.* Abor Hills. (Ind. Mus.) Khasi Hills. Garo Hills. (Ind. Mus.)

82. (*Nil.*) **Natrix rianguligerus** (Boie.) *Boie's Keelback.*

Boulenger, Cat. Vol. I, 1893, *p* 224; *l. c. Vol. III,* 1896, *p* 604 ; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 42.

Lepid.—Ventrals. 134 to 150.

Distn.—*Burma.* Tenasserim. *Siam.* The Peninsula. *S. China.* Tschonglok. (Muller). *Malay Peninsula. Malay Archipelago.* Sumatra to Celebes.

83. (*Nil.*) **Natrix venningi** (Wall.) *Venning's Keelback.*

Venning, Bomb. N. H. J. Vol. XX, p 774 ; *Wall, Bomb. N. H. J. Vol. XX,* p 345.

Type.—In the British Museum from the Chin Hills, Burma. Co-types in the Bombay colln.

Length.—750 mm. (2 feet, 5½ inches).

Lepid.—Costals. 19 at midbody, 17 behind. Ventrals. 161 to 172. Subcaudals. 108 to 138.

Distn.—*Burma.* Chin Hills.

Note.—I have examined ten specimens.

84. (*Nil.*) **Natrix xenurus** (Wall) *Wall's Keelback.*

T. modestus. *Sclater, List. Sn. Ind. Mus.* 1891, *p* 36. (*part, No* 4278).

T. xenura. *Wall, Bomb. N. H. J. Vol. XVII, p* 616 ; *Rec. Ind. Mus.* 1909, *p* 145.

Type.—In the Bombay collection from Khasi Hills.

Lepid.—Costals. 19 at midbody, 17 behind. Ventrals. 158 to 165. Anal. divided. (entire (?) in the type). Subcaudals. 81 to 107 ; entire.

Distn.—*Assam.* Khasi Hills. (Near Shillong. Cherrapunji.)

85. (*Nil.*) **Natrix nicobariensis** (Sclater.) *Sclater's Keelback.*

Prymnomiodon chalceus. *Boulenger, Cat. Vol. I,* 1893, *p* 192.

T. nicobarensis. *Annandale, J. A. S., Beng.,* 1905, *pp* 174 *and* 175 ; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 42.

Type.—In the Indian Museum, (No 8895) from the Nicobars.

Lepid.—Costals. 19 in midbody, 17 behind. The anal shield appears to me to have been entire, and the division now seen traumatic, as already suggested by Annandale.

Distn.—Nicobar Islands.

Note.—I have examined the maxillary dentition and find there is no gap posteriorly, and that the posterior teeth are distinctly enlarged. It appears to me without doubt a *Natrix.*

86. (Nil) **Natrix leonardi** (Wall). *Leonard's Keelback.*

N. leonardi *Wall. Bomb. N. H. J. Vol. XXIX, p* 466.

Type.—In the British Museum from Burma.

Length.—660 mm. (2 feet, 2 inches).

Lepid.—Costals. 17 in midbody, 15 behind. Ventrals. 152. Anal divided. Subcaudals. 46, divided.

Distn.—Burma. Sinlum Kaba. (Lat. 24° Long 97·5°)

FOOTNOTE.

Natrix baileyi (Wall.) *Bailey's Keelback.*

Wall, Bomb. N. H. J. Vol XVII, p 617.

Types.—In the British Museum from Thibet.

Length.—762 mm. (2 feet, 6 inches).

Lepid.—Costals. 19 at midbody, 17 behind. Ventrals. 201 to 221. Anal. Divided. Subcaudals. 98 to 111 (? 91) divided; some of those at the base frequently entire.

Distn.—Thibet. At about 14,000 feet elevation.

Note.—Strictly speaking, this is not a species within the political boundaries of British India, but it is convenient to include it in this paper. I have examined the maxillary dentition of one specimen and find it accords with that of the genus *Natrix.* The teeth number 21 (? 22) are syncranterian, and coryphodont.

Genus.—NERODIA *Baird and Girard.*

1766 Coluber. *Linné, part. Syst. Nat. 1, p* 378 (*type C. berus*).

1768 Coronella. *Laurenti, part. Syn. Rept., p* 87 (*type C. austriaca*).

1799 Hydrus. *Schneider, part, Hist. Amph. 1, p* 247 [*type H. bicolor=H. platurus* (*Linné*)]

1816 Enhydrus. (*non Latreille* 1802.) *Oken, Lehrb. Naturg III, p* 232.

1824 Natrix. (*non Laurenti* 1768.) *Wagler, Spix. Serp. Bras., p* 29, *pl X, fig* 2.

1826 Tropidonotus. *Boie, part, Isis, p* 205. [*type N. natrix* (*Linné*)].

1853 Nerodia. *Baird and Girard, N. Amer. Rept., p* 38 [*type N. sipedon=N. fasciata* (*Linné*)]

1853 Regina. *Baird and Girard, N. Amer. Rept., p* 45 [*type N leberis=N septemvittata* (*Say*)]

1860 Amphiesma. (*non Dum and Bibron,* 1854.) *Hallowell, Proc. Ac. Philad, p* 503.

1863 Neusterophis. *Günther, Proc. Zool. Soc., p.* 16 (*type N. laevissima*).

1863 Enicognathus. *Jan. Arch. Zool. Anat. Phys. II, p* 278 [*type N. punctatostriatus=N olivacea* (*Peters*).]

1865 Helicops. (*non Wagler,* 1828.) *Jan. Arch. Zool. Annat. Phys. III, p* 246.

1868 Fowlea. *Theobald, Cat. Rept. As. Soc. Mus. p* 57 [*type N. peguensis =N. punctulata* (*Günther*)]

1871 Contia. (*non Baird and Girard,* 1853.) *Cope, Proc. Ac. Philad, p* 223.

1885 Eutaenia. (*non Baird and Girard,* 1853.) *Cope, Proc. Ac. Philad. XXII, p* 386.

1893 Diplophallus. *Cope, Amer. Nat. XXVII, p* 483 [*type N. piscator* (*Schneider*)]

1898 Grayia. *Sclater, Ann. S. Afric. Mus. I, p* 109 [*type G. lubrica =N. laevissima* (*Günther*)]

1893 Ceratophyllus. *Cope, Amer. Nat. XXVII, May, p* 483 [*type R. vittata* (*Linné*).]

1905 Macropisthodon. (*non Boulenger,* 1893.) *Annandale, J. A. S., Beng., p* 210.

87. (438) **Nerodia punctulata** (Günther.) *The Burmese Keelback.*

Tropidonotus punctulatus. *Boulenger, Cat. Vol. I,* 1893, *p* 228 ; "*Keswal,*" *Bomb. N. H. J. Vol. I, p* 173 ; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 41 ; *Wall and Evans, Bomb. N. H. J. Vol. XIII, p.* 351.

Lepid.—Ventrals. 138 to 154.

Distn.—*Lower Burma* Pegu. (Brit. Mus.) Watiya. (W. and Evans.) Rangoon. Amherst. (Ind. Mus.). Tenasserim. (Mergui. Ind. Mus.)

88. (423) **Nerodia modesta** (Günther.) *Günther's Keelback.*

Tropidonotus modestus. *Boulenger, Cat. Vol. I,* 1893, *p* 229 ; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 36. (*part, all excepting No* 4278 *which is N. xenurus Wall.*)

Distn.—*Assam.* Khasi Hills. *China.* Yunnan.

89. (435, 437) **Nerodia piscator** (Schneider). *The Chequered Keelback.*

Tropidonotus quincunciatus. *Abercromby, Sn. of Ceylon,* 1910, *p* 46 ; "*Keswal*", *Bomb. N. H. J. Vol I, pp* 119 *and* 173.

Tropidonotus asperrimus. *Abercromby, Sn. of Ceylon,* 1910, *p* 48 ; *Spol. Zeylan.* 1911, *p* 206 ; *l. c.* 1913, *p* 146 ; *Boulenger, Cat. Vol. I,* 1893, *p* 232 ; *Pearless, Spol. Zeylan.* 1909, *p* 54; *Sarasin, Zool Jahr. Jena.* 1910, *pp* 127 *and* 144 ; *Wall, Spol. Zeylan.* 1910, *p* 35 ; *Willey, Spol. Zeylan.* 1906, *p* 233.

Tropidonotus tytleri. *Blyth, J. A. S., Beng., Vol. XXIII, p* 291 ; *And. Islanders, p* 365.

Tropidonotus sanctijohannis. *Boulenger, Cat. Vol. I,* 1893, *p* 230 ; *l. c. Vol III,* 1896, *p* 604.

Tropidonotus piscator. *Abercromby, Sn. Ceylon.* 1910, *pp* 51 *and* 76 ; *Alcock and Rogers, Proc. Roy. Soc.* 1902, *p* 452 ; *Annandale, J.A.S., Beng.* 1905, *pp* 174 *and* 175 ; *Rec. Ind. Mus.* 1912, *pp* 37, 49 *and* 53 ; *Begbie, Bomb. N. H. J. Vol. XVI. p* 516 ; *Boulenger, Cat. Vol. I,* 1893, *p* 230 ; *l. c. Vol. III,* 1896, *p* 604 ; *Rec. Ind. Mus.* 1913, *p* 338 ; *Ferguson, Bomb. N. H. J. Vol. X, p* 72 ; *Millard, Bomb. N. H. J. Vol. XV, p* 348 ; *Richards, Bomb. N. H. J. Vol. XXV p* 150 ; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 40 ; *Wall and Evans. Bomb. N. H. J. Vol. XIII, pp* 351 *and* 619 ; *Wall, Bomb. N. H. J. Vol. XIII, p* 373 ; *l. c. Vol. XV, p* 524 ; *l. c. Vol. XVI, pp* 305, 388 and 390 ; *l. c. Vol XVII, pp* 107 *and* 857 ; *l. c. Vol. XVIII, p* 318 ; *l. c. Vol. XIX, pp* 340, 611, 756, 757*a and* 898 ; *l. c. Vol. XX, p* 1034 ; *l. c. Vol. XXVI, p* 560; *Rec. Ind. Mus.* 1907, *p* 156.

Nerodia piscator. *Wall, Spol. Zeylan.* 1921, *p* 397 ; *Oph. Tap.* 1921, *p* 91.

Length.—1,290 mm. (4 feet, 2¾ inches).

Lepid.—Ventrals. 125 to 154. Subcaudals, 58 to 90.

Distn.—*Ceylon. Peninsular India.* To Baluchistan in the extreme North-West. *N. W. Frontier.* To Malakand. *Western and Eastern Himalayas. Assam.* Abor Hills. *Burma.* As far North as Mansi, and

Bhamo. *Andamans. Malay Peninsula. Siam. Indo-China. China.* As far North as Fokien. *Malay Archipelago.* Sumatra. Borneo. Java. *Formosa.*

FOOTNOTE.

Nerodia tessellata (Laurenti.) *Laurenti's Keelback.*

Tropidonotus tessellatus. *Boulenger, Cat. Vol. I,* 1893, *p* 233; *l. c. Vol. III.* 1896, *p* 605 ; *Wall, Bomb. N. H. J. Vol. XVIII, p* 798 ; *l. c. Vol. XXI, p* 133.

Distn.—S. E. Europe. N. Africa. Central and S. W. Asia.

Note.—Has not yet been recorded within the political limits of British India. I obtained a specimen from Mastuj in North Chitral Territory and on that account it is convenient to mention it here.

Genus.—RHABDOPHIS *Fitzinger.*

1766 Coluber. *Linné, part, Mus. Ad. Frid., p* 26, *pl XVIII, fig.* 2 (*type C berus*).

1768 Natrix. *Laurenti, part, Syn. Rept., p* 74 [*type N. natrix* (*Linné*)].

1801 Elaps. *Schneider, part. Hist. Amph. II, p* 299 [*type E. marcgravi* (*Wied*)].

1826 Tropidonotus. *Boie, part. Isis.,* p 205 [*type N. natrix.* (*Linné*)].

1843 Rhabdophis. *Fitzinger, Syst. Rept., p* 27 [*type R. subminiatus* (*Schlegel*)].

1843 Steirophis. *Fitzinger, Syst. Rept., p* 27 [*type R. chrysargus* (*Kuhl.*)].

1854 Amphiesma. *Dumeril and Bibron, part. Erp. Gen. VII, p* 724 (*type R stolatus*).

1854 Leptophis. (*non Holbrook,* 1842.) *Dumeril and Bibron, part, Erp. Gen. VII, p* 541.

1858 Xenodon. (*non Boie,* 1827.) *Günther, part, Cat., p* 58.

1858 Dromicus. (*non Bibron,* 1843.) *Günther, Cat., p* 133.

1863 Thamnosophis. *Jan., part, Elenco,* p 82 [*type R. lateralis* (*Dum and Bibron*)].

1867 Zamenis. (*non Wagler,* 1830.) *Steindachner, Sitz. Zool. bot. Ges. Wien. XVII, p* 513.

1876 Herpetoreas. *Günther, Proc. Zool. Soc., p* 16 [*type H. sieboldi = R. platyceps* (*Blyth*)].

1877 Ahaetulla. (*non Gray,* 1825.) *Boettger, Abh. Senck. Ges. XI, p* 33.

1881 Philothamnus. (*non Smith,* 1840.) *Boettger, Abh. Senck. Ges. XII, p* 526.

1882 Ptyas. (*non Fitzinger,* 1843.) *Günther, Ann. and Mag. Nat. Hist.* (5) *IX, p* 263.

1886 Bothrodytes. *Cope, Proc. Amer. Phil. Sc. XXIII, p* 495 [*type R. subminiatus* (*Schlegel*)].

90. (424) **Rhabdophis platyceps** (Blyth). *Blyth's Keelback.*

Tropidonotus platyceps. *Annandale, Rec. Ind. Mus.* 1912, *pp* 37, 49 *and* 53; *Boulenger, Cat. Vol. I,* 1893, *p* 248; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 36 ; *Wall, Rec. Ind. Mus.* 1907, *p* 156; *Bomb. N. H. J. Vol. XIX, p* 340.

Distn.—Western Himalayas. As far West as Kashmir. *Eastern Himalayas. Assam.* Abor Hills. Khasi Hills.

Note.—No 8622 of Sclater's list is reported from Allahabad. The same donor, Mr. J. O. Cockburn, records specimens of *Trachischium guentheri* (Nos 8763 and 8764 of Sclater's list) from the same locality. Both records are equally untrustworthy. No 80—4 Bombay collection from Taunggyi, S. Shan States, donor Mr. Lightfoot, I discredit. It is significant that Nos 620 and 621 of the same collection, both of which are *Macropisthodon plumbicolor*; are also reported from Taunggyi, and presented by the same Collector.

91. (432) **Rhabdophis himalayanus** (Günther). *The Orange-collared Keelback.*

Macropisthodon himalayanus. *Annandale, J. A. S., Beng.*, 1905, *p* 210.
Tropidonotus himalayanus. *Boulenger, Cat. Vol. I,* 1893, *p* 251; *Rec. Ind. Mus.* 1913, *p* 338; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 38; *Venning, Bomb. N. H. J. Vol. XX, p* 341; *l. c. p* 773; *Wall and Evans, Bomb. N. H. J. Vol. XIII, p* 537; *Wall, Bomb. N. H. J. Vol. XVIII, p* 319; *l. c. Vol. XIX, pp* 341, 614 *and* 757*a.*
Length.—864 mm. (2 feet, 10 inches).
Lepid.—Ventrals. 157 to 177. Subcaudals. 78 to 97.
Distn.—*Eastern Himalayas.* Nepal to Sikkim. *Assam.* Plains and Hills. Kaptai. Nr. Chittagong. (Nos 14574 and 14579. Ind. Mus.) *Burma.* Manipur. Chin Hills. S. Shan States. (Taunggyi, No 81-9 Bomb. colln.) Moulmein. (Nos 7417 and 7418. Ind. Mus.) Tenasserim. (Sclater.) *China.* Yunnan.
Note.—Reported by Beddome from the Anamallai Hills evidently in error. (See note below *Natrix parallelus.*)

92. (430) **Rhabdophis ceylonensis** (Günther). *The Ceylon Keelback.*

Tropidonotus ceylonensis. *Abercromby, Sn. of Ceylon* 1910, *p* 75; *Spol. Zeylan.* 1913, *p* 145; *Boulenger, Cat. Vol. I,* 1893, *p* 252; *l. c. Vol. III,* 1896, *p* 607; *Sarasin, Zool. Jahr. Jena.* 1910, *p* 127; *Willey, Spol. Zeylan.* 1906, *p* 233.
Rhabdophis ceylonensis. *Wall, Oph. Tap.* 1921, *p* 103.
Lepid.—Ventrals. 131 to 141. Subcaudals. 35 to 54.
Distn.—*Ceylon.* Hills.

93. (426) **Rhabdophis beddomei** (Günther). *Beddome's Keelback.*

Tropidonotus beddomii. *Boulenger, Cat. Vol. I,* 1893, *p* 252; *Ferguson, Bomb. N. H. J. Vol. X, p* 72; *Sarasin, Zool. Jahr. Jena.* 1910, *p* 137; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 37; *Wall, Bomb. N. H. J. Vol. XXVI, p* 560.
Length.—692 mm. (2 feet, 3¼ inches).
Lepid.—Subcaudals. 62 to 81.
Distn.—*Western Ghats.* Mahableshwar to Tinnevelly.

94. (434) **Rhabdophis stolatus** (Linné). *The Buff-striped Keelback.*

Tropidonotus stolatus. *Abercromby. Sn. Ceylon,* 1910, *pp* 46, 47, 49, *and* 76; *Spol. Zeylan.* 1911, *pp* 206 *and* 207; *l.c.* 1913, *pp* 144 *and* 146; *Annandale, J. A. S., Beng.*, 1905, *p* 175; *Rec. Ind. Mus.* 1911, *p* 218; *Boulenger, Cat. Vol. I,* 1893, *p* 253; *Rec. Ind. Mus.* 1913, *p* 338; *Ferguson, Bomb. N. H. J. Vol. X, p* 72; *Pearless, Spol. Zeylan,* 1909, *p* 54; *Sarasin, Zool. Jahr. Jena.* 1910, *p* 131; *Wall and Evans, Bomb. N. H. J. Vol. XIII, pp* 351 *and* 619; *Wall, Bomb. N. H. J. Vol. XII, p* 765; *l. c. Vol. XV, p* 525; *l. c. Vol XVI, pp* 302 *and* 390; *l. c. Vol. XVIII, pp* 108, 205 *and* 320; *l. c. Vol. XIX, pp* 341, 615 *and* 898; *l. c Vol. XX, p* 603; *l. c. Vol. XXVI, p* 562; *Spol. Zeylan.* 1905, *p* 146; *Rec. Ind. Mus.* 1907, *p* 156; *Willey, Spol. Zeylon.* 1906, *p* 233.
Rhabdophis stolatus. *Wall, Spol. Zeylan.* 1921, *p* 397; *Oph. Tap.* 1921, *p* 105.
Length.—762 mm. (2 feet, 6 inches).

Distn.—Ceylon. Peninsular India. Up to about 5,000 feet. As far North as Sind. *N. W. Frontier.* (Malakand F. W.) *Himalayas. Assam.* North and South of the Bramaputra. *Burma.* As far North as Myitkyina. (Lat. 26°. Long. 96·3°). South to Tenasserim. *Andamans. Nicobars. Malay Peninsula. Siam. China.* Yunnan. *Formosa. Philippines.*

95. (429) **Rhabdophis nigrocinctus** (Blyth). *The Black-banded Keelback.*

Tropidonotus nigrocinctus. *Boulenger, Cat. Vol. I,* 1893, *p* 255 ; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 37.

Lepid.—Ventrals. 155 to 171.

Distn.—Burma. Pegu. Tenasserim. Tavoy. (Ind. Mus.) Kawkareik, Dawna Hills. (F. W.) *Siam.* Klong Bang Lai. Patiyu. (M. Smith).

96. (431) **Rhabdophis subminiatus** (Schlegel). *The Vermilion-necked Keelback.*

Tropidonotus subminiatus. *Boulenger, Cat. Vol. I,* 1893, *p* 256 , *Sclater, List. Sn. Ind. Mus.* 1891, *p* 38 ; *Venning, Bomb. N. H. J. Vol. XX, pp* 341 *and* 773; *Wall and Evans, Bomb. N. H. J. Vol. XIII pp* 351 *and* 619 ; *Wall, Bomb. N. H. J. Vol. XVIII, p* 320 ; *l. c. Vol. XIX, pp* 341, 618 *and* 757*a*.

Length.—1,080 mm. (3 feet, 6½ inches).

Lepid.—Ventrals. 132 to 175. Subcaudals. 61 to 97.

Distn.—Eastern Himalayas. Nepal to Sikkim. *Assam.* As far North as Dibrugarh. *Burma.* As far North as Myitkyina. (Lat. 26°. Long. 96·3°). South to Tenasserim. (Mergui. Ind. Mus.) East to S. Shan States. (Taunggyi.) *Siam. Indo-China. China.* Yunnan. *Malay Peninsula. Malay Archipelago.* Java. Celebes. Ternate.

Note.—Beddome's record "Madras Hills" is to be discredited. See note below *Natrix parallelus.*

97. (428) **Rhabdophis chrysargus** (Schlegel). *Schlegel's Keelback.*

T. chrysargus. *Boulenger, Cat. Vol. I,* 1893, *p* 258; *Rec. Ind. Mus.* 1913, *p* 338; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 37; *Wall, Rec. Ind. Mus.* 1909, *p* 145.

Tropidonotus vibakari. *Sclater, List. Sn. Ind. Mus.* 1891, *p* 41.

Length.—728 mm. (2 feet, 4⅝ inches).

Lepid.—Ventrals. 156 to 175. Subcaudals. 60 to 102.

Distn.—Eastern Himalayas ? Burma. Tenasserim. *Peninsular Siam. Malay Peninsula. S. China. Malay Archipelago.* Sumatra. Java. Borneo. Palawan.

Note.—This species, and *firthi* Wall, have been confused, and it is difficult to define the exact habitat of the former North of Tenasserim in consequence. Two specimens from Nepal submitted to Mr. Boulenger by Dr. Annandale were pronounced *chrysargus.* These with another from the Eastern Himalayas constituted the types of my *firthi,* and other specimens from the Eastern Himalayas, and Assam Hills identified as *chrysargus* may prove to be *firthi.* A specimen from "Burma" is in the British Museum ("g" of Boulenger's Catalogue) but "Burma" has been often loosely applied by our older herpetologists, and it is possible that this may have come from Tenasserim a Province within the Political boundaries of Burma. I have examined 12 specimens from Tenasserim.

98. (*Nil.*) **Rhabdophis firthi** (Wall). *Firth's Keelback.*

Tropidonotus chrysargus ? *Boulenger, Rec. Ind. Mus.* 1913, *p* 337 ; *Wall, Rec. Ind. Mus.* 1907, *p* 156.

Tropidonotus firthi. *Wall, Bomb. N. H. J. Vol. XXIII, p* 166.
Types.—In the Indian Museum. (Nos 15817 and 15818 from Chitlong, Nepal).
Length.—About 455 mm. (about 1 foot, 6 inches). Not measured.
Lepid.—Ventrals. 173 to 199. Subcaudals. 80 to 88.
Distn.—*Eastern Himalayas.* Nepal to Sikkim. *Assam* ? Silonibari, N. Lakhimpur (Boulenger).
Note.—See note below last species.

99. (433) **Rhabdophis monticola** (Jerdon). *Jerdon's Keelback.*

Tropidonotus monticola. *Boulenger, Cat. Vol. I,* 1893, *p* 259 ; *Ferguson, Bomb. N. H. S. Vol. XIV, p* 386 ; *Sarasin, Zool. Jahr. Jena.* 1910, *p* 137 ; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 39 ; *Wall, Bomb. N. H. J. Vol. XXVI, p* 562.
Length.—577 mm. (1 foot, 10¾ inches).
Lepid.—Ventrals. 133 to 145. Subcaudals. 78 to 92.
Distn.—*Western Ghats.* From Talevadi, Goa Frontier (Ind. Mus.) to Travancore.

Genus.—PHAYREA *Theobald.*

1868 Phayrea. *Theobald, Cat. Rept. As. Soc. Mus., p* 51 (*type Pisabellina*).
1896 Psammophis. (*non Wagler,* 1830). *Boulenger, part, Cat. Vol. III, p* 165.

100. (*Nil.*) **Phayrea isabellina** Theobald. *Phayre's Snake.*

Phayrea isabellina. *Theobald, Cat. Rept. As. Soc. Mus.* 1868, *p* 51 ; *Wall, Rec. Ind. Mus. Aug.* 1921, *p* 109.
Psammophis condanarus. *Boulenger, Cat. Vol. III,* 1896, *p* 165 (*part*).
Type.—In the Indian Museum, from Bassein.
Length.—520 mm. (1 foot, 8½ inches). Tail 145 mm. (5¾ inches).
Lepid.—Costals. Two heads-lengths behind the head 19, at midbody 19, two heads-lengths before the vent 17 ; smooth. Ventrals. 166. Anal. Divided. Subcaudals. 82, divided.
Distn.—*Burma.* Bassein (Theobald).
Note.—This snake is closely allied to the members of the genus *Rhabdophis,* and is not an *Opisthoglyph.* The teeth in the left maxilla are diacranterian. The praecranterian are 17 (?) in number and moderately coryphodont in type. The cranterian teeth number 2 and are about twice the length of the last praecranterian.

Genus.—MACROPISTHODON *Boulenger.*

101. (439) **Macropisthodon plumbicolor** (Cantor). *The Green Keelback.*

Tropidonotus plumbicolor. *Abercromby, Spol. Zeylan,* 1911, *p* 206 ; *Ferguson, Bomb. N. H. J. Vol. X, p* 72 ; *Fischer, Bomb. N. H. J. Vol. XVII, p* 527 ; *Pearless, Spol. Zeylan.* 1909, *p* 54 ; *Sclater. List. Sn. Ind. Mus.* 1891. *p* 41 ; *Willey, Spol. Zeylan.* 1906, *p* 233.
Macropisthodon plumbicolor. *Boulenger, Cat. Vol. I,* 1893, *p* 267 ; *l. c. Vol. III,* 1896, *p* 609 ; *Evans, Bomb. N. H. J. Vol. XX, p* 1164 ; *Fischer, Bomb. N. H. J. Vol. XVII, pp* 1 *and* 527 ; *Fletcher, Spol. Zeylan.* 1908, *p* 99 ; *Sarasin, Zool. Jahr. Jena.* 1910, *p* 130 ; *Wall, Bomb. N. H. J. Vol. XVI, p* 390 ; *l. c. Vol. XVII. p* 1 ; *l. c. Vol. XIX, p* 756 ; *l. c. Vol. XXVI, p* 563 ; *Oph. Tap.* 1921, *p* 128.
Length.—890 mm. (2 feet, 11 inches).
Lepid.—Costals. In midbody 21 to 27. Ventrals. 144 to 163. Subcaudals. 34 to 50.

Distn.—Peninsular India. Except the Ganges Valley. In or near elevated terrain usually up to 7,000 feet. *Punjab.* Ambala (Stoliczka). *Sind.* (Murray.) *Ceylon.*

Note.—See note to *Rhabdophis platyceps.*

Genus.—PSEUDOXENODON *Boulenger.*

102. (422) **Pseudoxenodon angusticeps** (Blyth). *The Mock Cobra.*

P. macrops. *Annandale, Rec. Ind. Mus.* 1912, *pp* 37, 49 *and* 53; *Boulenger, Cat. Vol. I,* 1893, *p.* 270; *Rec. Ind. Mus.* 1913, *p* 338; *Venning, Bomb. N. H. J. Vol. XX, pp* 340 *and* 772; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 36; *Wall, Bomb. N. H. J. Vol. XVIII, p* 321; *l. c. Vol. XIX, pp* 341, 757*a and* 898; *l. c. Vol. XX, p* 446.

Type.—From Ramri Island, Arakan, in the Indian Museum.

Length.—1,283 mm. (4 feet, 2½ inches).

Lepid.—Ventrals. 152 to 180. Subcaudals. 55 to 82.

Distn.—Eastern Himalayas. Nepal to Sikkim. *Assam.* Hills North of the Bramaputra. *Burma.* As far North as Myitkyina (Lat. 26°. Long. 96·3° Bombay colln.) South to Tenasserim. (Ind. Mus.). East to S. Shan States. (Taunggyi. Bombay colln.). *China.* Yunnan. (de Scabra) Sze-Chuen. (Brit. Mus.)

Note.—The name *Pseudoxenodon angusticeps* Blyth has page preference over *P. macrops* of the same Author (J. A. S., Beng., XXIII, 1855, p 296).

Genus.—HELICOPS *Wagler.*

103. (440) **Helicops schistosus** (Daudin). *The Olivaceous Keelback.*

Sub-species—*Helicops schistosus indicus.*

Abercromby, Spol. Zeylan. 1911, *p* 206; *l. c.* 1913, *p* 145; *Annandale, Rec. Ind. Mus.* 1911, *p* 218; *Boulenger, Cat. Vol I,* 1893, *p* 274; *Ferguson, Bomb. N. H. J. Vol. X, p* 72; *Sarasin, Zool. Jahr. Jena.* 1910, *p* 131; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 44; *Wall, Bomb. N. H. J. Vol. XVI, p* 391; *l. c. Vol. XVIII, p* 109; *l.c. Vol. XIX, p* 146; *l. c. Vol. XXI, p* 1009; *Oph. Tap.* 1921, *p* 135; *Willey, Spol. Zeylan.* 1906, *p* 233.

Length.—870 mm. (2 feet, 10¼ inches).

Lepid.—Ventrals. 128 to 161.

Distn.—Peninsular India. South of Rajputana, and to base of Himalayas further east. *Ceylon.*

Note.—A specimen in the Bombay collection (91-3), donor Major F. Wall, is labelled by mistake "Shillong." Sub-species, *H. schistosus andersoni* is known from China. Yunnan. (Ind. Mus.).

Genus.—TRACHISCHIUM *Günther.*

104. (336) **Trachischium fuscum** (Blyth.) *The Black-bellied Roughside.*

Ablabes gilgiticus. *Annandale, J. A. S., Beng.,* 1905, *p* 210; *Wall Rec. Ind. Mus.* 1919, *p* 147.

Trachischium fuscum. *Annandale, J. A. S., Beng.,* 1904, *p* 208; *Boulenger, Cat. Vol. I,* 1893, *p* 297; *Sclater, List. Sn. Ind. Mus.* 1891, *p.* 11; *Wall, Bomb. N. H. J. Vol. XIX, p* 342.

Lepid.—Ventrals. 150 to 165. Subcaudals. 28 to 42.

Distn.—Himalayas. Gilgit. Loharganj, Garhwal Dist. (Ind. Mus.) Sikkim. *Assam.* (Ind. Mus., Annandale.) Khasi Hills ? (Brit. Mus.)

Note.—I have not been able to trace the specimens referred to by Annandale (J. A. S., Beng., 1904, p 208.), presented by the Assam

Government to the Indian Museum. Khasi Hills rests on the authority of Jerdon who presented one specimen to the British Museum said to be from this locality.

105. (337) **Trachischium guentheri** Boulenger. *The Rose-bellied Roughside.*

Boulenger, Cat. Vol. I, 1893, *p* 298 ; *Sarasin, Zool. Jahr. Jena.* 1910, *p* 146 ; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 11, *Wall. Bomb. N. H. J. Vol. XIX, p* 343.

Length.—437 mm. (1 foot, 5¼ inches).

Lepid.—Ventrals. 132 to 154. Subcaudals. 29 to 38.

Distn.—*Sikkim.*

Note.—Nos 8763 and 8764 of Sclater's list of snakes in the Indian Museum presented by Mr. J. Cockburn, labelled "Allahabad", are obviously not from this locality. (*Vide* note attached to *Rhabdophis platyceps.*).

106. (338) **Trachischium tenuiceps** (Blyth.) *The Yellow-bellied Roughside.*

Boulenger, Cat. Vol. I, 1893, *p* 299 ; *Sarasin, Zool. Jahr. Jena.* 1910. *p* 146 ; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 11 ; *Wall, Rec. Ind. Mus.* 1907, *p* 156 ; *Bomb. N. H. J. Vol. XIX, p* 343.

Length.—406 mm. (1 foot, 4 inches).

Lepid.—Ventrals. 125 to 140. Subcaudals. 28 to 42.

Distn.—*Eastern Himalayas.* Nepal to Sikkim. *Bengal.* Hills near Barakar. (Anderson, J.A.S., Beng., Vol. XL, p 33).

Note.—Improbable as "Hills near Barakar" may at first sight seem, Annandale (Rec. Ind. Mus. 1912, p 47) from fairly extensive and varied collections, finds a Himalayan element in the fauna of Parasnath Hill. (4,480 feet.) Among other reptiles he obtained the Himalayan Lizard *Lygosoma sikkimense* there, so that Anderson's record of the snake *T. tenuiceps* from "Hills near Barakar" claims credit.

107. (339) **Trachischium monticola** (Cantor.) *Cantor's Roughside.*

Trachischium rubriventer. *Boulenger, Cat. Vol. I, p* 300.

Trachischium monticola. *Annandale, Rec. Ind. Mus.* 1912, *pp* 37, 45 *and* 53 ; *Boulenger, Cat. Vol. I,* 1893, *p* 299 ; *l. c. Vol. III,* 1896, *p* 612 ; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 12 ; *Wall, Bomb. N. H. J. Vol. XVIII, p* 322 ; *l. c. Vol. XIX, footnote, pp* 343 *and* 618.

Distn.—*Assam.* Hills North and South of the Bramaputra. *Eastern Himalayas ? Bengal.* Barakar. (Ind. Mus.)

Note.—I have examined the Barakar specimen and can confirm its identity. This may have come from Parasnath Hill. (See note attached to *T. tenuiceps.*) Eastern Himalayas rests on the authority of Jerdon who sent nine specimens from Darjeeling to the British Museum. This would lead one to suppose the species is common there, whereas it has not been found by any of the many other herpetologists who have explored that locality. I suggested (Bomb. N. H. J. Vol. XIX, p 343, footnote) that these specimens might have been collected in the Assam Hills where this species is common, and where Jerdon collected extensively. Eastern Himalayas seems to me a locality that calls for confirmation. Jerdon's *T. rubriventer* (Proc. A. S.. Beng., 1870, p 80) does not appear to me sufficiently differentiated to consider a distinct species.

108. (*Nil.*) **Trachischium quinquelabialis** Wall. *Wall's Roughside.*

Wall, Bomb. N. H. J. Vol. XXI, p 201.

Type.—From Muktesar, Western Himalayas. In the Indian Museum.

Length.—324 mm. (12¾ inches).
Lepid.—Costals. In 13 rows in midbody. Ventrals. 141 to 147. Subcaudals. 29 to 39. Supralabials. 5.
Distn.—*Western Himalayas.* Muktesar, and near Naini Tal. (F.W.)
Note.—I have now seen four specimens, three of which were taken at Muktesar at about 7,000 feet.

Genus—RHABDOPS *Boulenger.*

109. (361) **Rhabdops olivaceus** (Beddome). *Beddome's Smooth Snake.*

Pseudocyclophis olivaceus. *Boulenger, Faun. Brit. Ind. Rept.* 1890, *p* 300.
Rhabdops olivaceus. *Boulenger, Cat. Vol. I,* 1893, *p* 300 ; *Sarasin, Zool. Jahr. Jena.* 1910, *p.* 137 ; *Wall, Bomb. N. H. J. Vol. XXVI, p* 564.
Length.—780 mm. (2 feet, 6¾ inches).
Lepid.—Ventrals. 202 to 215. Subcaudals. 63 to 74.
Distn.—*Western Ghats.* Wynad.

110. (362) **Rhabdops bicolor** (Blyth.) *Blyth's Smooth Snake.*

Pseudocyclophis bicolor. *Boulenger, Faun. Brit. Ind. Mus.* 1890, *p* 300 ; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 16.
Rhabdops bicolor. *Boulenger, Cat. Vol. I,* 1893, *p* 301 ; *Wall, Bomb. N. H. J. Vol. XIII, p* 322 ; *l. c. Vol. XXI, p* 686.
Length.—676 mm. (2 feet, 2⅝ inches).
Lepid.—Ventrals. 190 to 214.
Distn.—*Assam.* Khasi Hills. *China.* Yunnan.

Genus—PLAGIOPHOLIS *Boulenger.*

111. (*Nil.*) **Plagiopholis blakewayi** Boulenger. *Blakeway's Snake.*

Boulenger, Cat. Vol. I, 1893, *p* 301. *Wall, Bom. N. H. J. Vol. XXIX, p* 467.

Distn.—*Burma.* S. Shan States. (Taunggyi. Brit. Mus.) Sinlum Kaba Lat. 24 (Long. 97·5) Bombay Collection.

Genus—XYLOPHIS *Beddome.*

112. (334) **Xylophis perroteti** (Dumeril and Bibron.) *Perrotet's Dwarf Snake.*

Boulenger, Cat. Vol. I, 1893, *p* 304 ; *l. c. Vol. III,* 1896, *p* 612 *Ferguson, Bomb. N. H. J. Vol. X, p* 71 ; *Sarasin, Zool. Jahr. Jena* 1910, *p* 138 ; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 11 ; *Wall, Bomb. N. H. J. Vol. XXVI, p* 564.
Lepid.—Ventrals. 130 to 150. Subcaudals. 14 to 40.
Distn.—*Western Ghats.* Wynad to Tinnevelly.

113. (335) **Xylophis stenorynchus** (Günther.) *Günther's Dwarf Snake.*

Annandale, J. A. S., Beng., 1904, *p* 208 ; *Boulenger, Cat. Vol. I,* 1893, *p* 304 ; *Ferguson, Bomb. N. H. J. Vol. X, p* 71 ; *Sarasin, Zool. Jahr. Jena.* 1910, *p* 138.
Lepid.—Ventrals. 108 to 132. Subcaudals. 12 to 31.
Distn.—*Western Ghats.* Anamalais to Tinnevelly.

Genus—HAPLOCERCUS *Günther.*

114. (346) **Haplocercus ceylonensis** Günther. *The Black-spined Snake.*

Boulenger, Cat. Vol. I, 1893, *p* 309 ; *Sarasin, Zool. Jahr. Jena.* 1910, *p* 127 ; *Wall, Bomb. N. H. J. Vol. XVIII, p* 784 ; *Oph. Tap.* 1921, *p* 143 ; *Willey, Spol. Zeylan.* 1906, *p* 233.

Length.—450 mm. (1 foot, 5¾ inches).
Lepid.—Ventrals. 177 to 217.
Distn.—*Ceylon.* Hills of Central, Uva and Sabaragamuwa Provinces.

Genus—Aspidura *Wagler.*

115. (345) **Aspidura trachyprocta** Cope. *The Common Roughside.*
Boulenger, Cat. Vol. I, 1893, *p* 313 ; *l. c. Vol. III,* 1896, *p* 613 ; *Fletcher, Spol. Zeylan.* 1908, *p.* 98 ; *Sarasin, Zool. Jahr. Jena.* 1910, *p* 127 ; *Sclater, List. Sn. Ind. Mus.* 1891 *p* 12 ; *Wall, Spol. Zeylan.* 1905, *p* 144 ; *Oph. Tap.* 1921, *p* 209 ; *Willey, Spol. Zeylan.* 1906, *p* 233.
Length.—412 mm. (1 foot, 4¼ inches).
Distn.—*Ceylon.* Hills of Central, and Uva Provinces.

116. (*Nil.*) **Aspidura drummondhayi** Boulenger. *Drummond-Hay's Rough side.*
Boulenger, Spol. Zeylan. 1094, *p* 95 ; *Sarasin, Zool. Jahr. Jena.* 1910, *p* 127 ; *Wall, Oph. Tap.* 1921, *p* 213 ; *Willey, Spol. Zeylan.* 1906, *p* 233.
Types.—From Balangoda. Preserved in the British Museum.
Lepid.– Ventrals. 112 to 135. Subcaudals. 18 to 26.
Distn.—*Ceylon.* Hills of Uva Province. (Balangoda.)

117. (342) **Aspidura brachyorrhus** (Boie.) *Boie's Roughside.*
Boulenger, Cat. Vol. I, 1893, *p* 311 ; *Pearless, Spol. Zeylan.* 1909, *p* 54 ; *Sarasin, Zool. Jahr. Jena.* 1910, *p* 127 ; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 12 ; *Wall, Oph. Tap.* 1921, *p* 204 ; *Willey, Spol. Zeylan.* 1906, *p* 233.
Length.—390 mm. (1 foot, 3 inches).
Lepids.—Ventrals. 139 to 159.
Distn.— *Ceylon.* In or near Hills.

118. (343) **Aspidura copei** Günther. *Cope's Roughside.*
Boulenger, Cat. Vol. I 1893, *p* 311 ; *Sarasin, Zool. Jahr. Jena.* 1910, *p* 217 ; *Wall, Oph. Tap.* 1921, *p* 207 ; *Willey, Spol. Zeylan.* 1906, *p* 233.
Length.—650 mm. (2 feet, 1 inch).
Distn.—*Ceylon.* Hills of Uva and Central Provinces.

119. (344) **Aspidura guentheri** Ferguson. *The Pigmy Roughside.*
Boulenger, Cat. Vol. I, 1893, *p* 312 ; *Sarasin, Zool. Jahr. Jena.* 1910, *p* 127 ; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 12 ; *Wall, Oph. Tap.* 1921, *p* 208 ; *Spol. Zeylan.* 1921, *p* 398 ; *Willey, Spol. Zeylan.* 1906 *p* 233.
Distn.—*Ceylon.* Western Province.

Genus.—Blythia *Theobald.*

120. (341) **Blythia reticulata** (Blyth.) *Blyth's Snake.*
Aproaspidops antecursorum. *Annandale, Rec. Ind. Mus.* 1912, *pp* 37, 46 *and* 53.
Blythia reticulata. *Annandale, Rec. Ind. Mus.* 1912, *pp* 37 *and* 45 ; *Boulenger, Cat. Vol. I,* 1893, *p* 314 ; *Rec. Ind. Mus.* 1913, *p* 338 ; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 12 ; *Venning, Bomb. N. H. J. Vol. XX, pp* 336 *and* 771 ; *Wall, Bomb. N. H. J. Vol. XVIII, p* 323.
Lepid.—Ventrals. 122 to 157. Subcaudals. 16 to 32.
Distn.—*Assam.* Hills North and South of the Bramaputra to Manipur (F. W.) *Burma.* Hills. Sima. (Lat 25°. Long. 97·2°. Bombay colln.). Chin Hills. (Haka.) Lushai Hills.

Genus—TRIRHINOPHOLIS *Boulenger.*

121. (*Nil.*) **Trirhinopholis nuchalis** Boulenger. *The Arrow-head Snake.*

Oligodon evansi. *Wall, Bomb. N. H. J. Vol. XXII, p* 514.

Trirhinopholis nuchalis. *Boulenger, Cat. Vol. I,* 1893, *p* 419; *l.c. Vol. III,* 1896, *p* 612; *Wall, Bomb. N. H. J. Vol. XXVI, p* 863; *l. c. Vol.XXVII, p* 175; *l.c. Vol. XXVIII, p* 43; *l. c. Vol. XXIX, p* 466.

Length.—470 mm. (1 foot, 6½ inches).

Lepid.—Ventrals. 131 to 141. Subcaudals. 23 to 27. (I omitted to remark against one in a previous paper with subcaudals 19 from Taunggyi, that the tail was incomplete.)

Distn.—*Burma.* Hills between the Chindwin and Salween Rivers, as far North as Mansi and Sima, Lat. 25° Long. 97·2°. (Bombay colln.) S. Shan States (Thondaung. F. W. Taunggyi. Bombay colln.) Karenni. (Brit. Mus.) *Siam.* Ratchaburi, on the Western Boundary. (M. Smith.)

Genus—OPHITES *Wagler.*

1826 Lycodon. *Ferrusac, part, Bull. Scien. Nat. p* 238 [*type L. audax=Hormonotus modestus* (*Dumeril and Bibron*).

1830 Ophites. *Wagler, Syst. Amph., p* 186 [*type O. subcinctus* (*Boie*)].

1853 Sphecodes. *Dumeril and Bibron, Mem. Acad. Scient. XXIII, p* 461. (*type S. albofuscus*).

1858 Tetragonosoma. *Gunther, Cat. p* 253 [*type T. effrenis* (*Cantor*)].

1863 Lycophidion. *Peters, Mon. Berl. Acad., p* 403 [*type L. bipunctatum=Ophites jara* (*Shaw*)].

1868 Tytleria. *Theobald, Cat. Rept. As. Soc. Mus., p* 66 [*type T. hypsirhinoides=Ophites aulicus* (*Linnè*)].

1870 Cercaspis. (*non Dumeril and Bibron.,* 1854.) *Beddome, Madras Monthly Jour. Med. Sc.*

1884 Elapoides (*non Boie,* 1827.) *Sauvage, Bull. Soc. Phil.* (7), VIII, *p* 144.

122. (347) **Ophites striatus** (Shaw) *Shaw's Wolf Snake.*

Lycodon striatus. *Annandale, J. A. S., Beng.,* 1904, *p* 208; *Mem. A.S., Beng., Vol. I, p* 194; *Boulenger, Cat. Vol. I,* 1893, *p* 349; *Green. Spol. Zeylan.* 1905, *p* 205; *l. c.* 1906, *pp* 233 *and* 234; *Sarasin, Zool; Jahr. Jena.* 1910, *p* 130; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 13; *Wall, Spol. Zeylan.* 1907, *p* 174; *Bomb. N. H. J. Vol. XVIII, p* 110 *l. c. Vol. XIX, p* 102; *l. c. Vol. XX, p* 1034; *Willey, Spol. Zeylan* 1906, *p* 233.

Ophites striatus. *Wall, Oph. Tap.* 1921, *pp* 147.

Lepid.—Ventrals. 150 to 196. Subcaudals. 34 to 66.

Distn.—*Ceylon. Peninsular India.* To the Himalayas. *Western Himalayas.* Kasauli (F.W.) *Punjab. Sind. Baluchistan. Persia.* Khwaja. (Ind. Mus.). *Transcaspia.*

123. (348) **Ophites jara** (Shaw.) *The Twin-spotted Wolf Snake.*

Lycodon jara. *Boulenger, Cat. Vol. I,* 1893, *p* 350; *l. c. Vol. III,* 1896, *p* 618; *Rec. Ind. Mus.* 1913, *p* 338; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 14; *Wall, Bomb. N. H. J. Vol. XIX, pp* 344 *and* 619.

Length.—539 mm. (1 foot, 9¼ inches).

Lepid.—Ventrals. 167 to 188. Subcaudals. 52 to 74.

Distn.—*Bengal.* Alipur. Sibpur. (Ind. Mus.) Saraghat. (F. W.) *East Himalayas.* Pashok. Tindharia. (F. W.) *Assam.* Dibrugarh. Sadiya. Makum. Namsang. (F. W.) Dejoo, N. Lakhimpur. N. Cachar. (Ind. Mus.) Monacherra, Cachar.(Bombay colln.). *Burma.* Manipur. (F. W.) Pegu. ? (Stoliczka.)

Note.—Specimens in the British Museum of Colonel Beddome's collecting are labelled " Malabar ", and " Anamallays". These localities are to be discredited for reasons cited in the note below *Natrix parallelus.* Pegu on the authority of Stoliczka calls for confirmation.

124. (349) **Ophites anamallensis** (Günther.) *Günther's Wolf Snake.*

Lycodon anamallensis, *Boulenger, Cat. Vol.* I, 1893, p 351; *Sarasin, Zool. Jahr. Jena.* 1910, *p* 138.

Distn.— Western Ghats. Anamalais. Wynad.

Note.—In view of the fact that I have had specimens of *striatus* and *aulicus* in which the loreal is divided into two, and specimens of both in which the anal is entire, I think this species may have to be united with *aulicus.* Only two specimens are known both of which are in the British Museum.

125. (351) **Ophites aulicus** (Linné.) *The Common Wolf Snake.*

Lycodon aulicus. *Abercromby, Spol. Zeylan.* 1911, *pp* 205 *and* 206 *Annandale, J. A. S., Beng.*, 1905, *pp* 173 *and* 175; *Boulenger, Cat. Vol. I, p.* 352 ; *l. c. Vol. III, p* 618; *Blyth, And. Islanders, pp* 365 *and* 366; *Ferguson, Bomb. N. H. J. Vol. X, p* 71; *Pearless, Spol. Zeylan,* 1909, *p* 54 ; *Sarasin. Zool. Jahr. Jena.* 1910, *p* 131; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 14 ; *Wall* and *Evans, Bomb, N. H. J. Vol. XIII, pp* 348 *and* 616; *Wall, Bomb. N. H. J. Vol. XV. p* 706 ; *l. c. Vol. XIV, pp* 293 *and* 387 ; *l. c. Vol. XVIII, p* 112; *l. c. Vol. XIX, pp* 87, 344, 619, 756, 757*a* ; 898 ; *l. c. Vol. XX. p* 521; *l. c. Vol. XXVI, p* 565 ; *Rec. Ind. Mus.* 1907, *p* 156; *Willey, Spol. Zeylan.* 1906, *p* 233.

Ophites aulicus. *Wall. Oph. Tap.* 1921, *p* 151.

Length.—838 mm. (2 feet, 9 inches).

Lepid.—Ventrals. 177 to 224. Subcaudals. 53 to 80.

Distn.—Ceylon. Peninsular India. Sind. Larkhana. (Bombay colln.). *Himalayas.* Kulu to Sikkim. *Assam.* As far North as Dibrugarh. *Burma.* As far North as Myitkyina. South to Tenasserim. East to Shan States. *Andamans. Nicobars. Malay Peninsula. Indo-China. China.* Yunnan. Southern Provinces and neighbouring Islands. *Malay-Archipelago.* Java to Timor. *Philippines.*

126. (*Nil.*) **Ophites flavomaculatus** (Wall.) *Wall's Wolf Snake.*

Lycodon flavomaculatus. *Sarasin, Zool. Jahr. Jena.* 1910, *p* 138 ; *Wall, Bomb. N. H. J. Vol. XVII, p* 612.

Types.—In the British Museum from Oudi and Kirkee.

Length.—350 mm. (1 foot, 1¾ inches).

Lepid.—Ventrals. 165 to 182. Anal. Divided. Subcaudals. 53 to 62.

Distn.— Western Ghats. (Nasik. Kirkee. Poona. Deolali. Dharwar. Sangli. Lat. 16° & Long. 75°.) *Berar.* (Buldana. Lat. 20·5°. Long 76°).

Note.—Was confused with *L. jara* for many years.

127. (350) **Ophites travancoricus** (Beddome.) *Beddome's Wolf Snake.*

Lycodon travancoricus. *Boulenger, Cat. Vol. I,* 1893, *p* 355; *Ferguson Bomb. N. H. J. Vol. X, p* 71 ; *Sarasin, Zool. Jahr. Jena.* 1910, *p* 138; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 14 ; *Wall, Bomb. N. H. J. Vol. XVI, p* 297 ; *l. c. Vol. XIX, p* 756 ; *l. c. Vol. XXVI, p* 565.

Length.—742 mm. (2 feet, 5¼ inches).

Distn.—Hills of Peninsular India. Western Ghats. (From Matheran to Tinnevelly.) S. Arcot. Vizagapatam. (Bombay colln.) Jubbulpore, C. P. (Bombay colln.)

128. (352) **Ophites atropurpureus** (Cantor.) *Cantor's Wolf Snake.*

Lycodon atropurpureus. *Boulenger, Cat. Vol. I,* 1893, *p* 356.

Type.—From Mergui, is lost.

Distn.—*Bengal. Assam ? Burma.* Mergui.

Note.—The type of Cantor's *subfuscus* (synonymous) from Bengal is also lost. No representative is known in any Museum.

129. (354) **Ophites fasciatus** Anderson *Anderson's Wolf Snake.*

Lycodon fasciatus. *Boulenger, Cat. Vol. I,* 1893, *p* 358; *l. c. Vol. III,* 1896, *p* 618; *Evans, Bomb. N. H. J. Vol. XVI,p* 169; *Sclater, List Sn. Ind. Mus.* 1891, *p* 15; *Wall and Evans, Bomb. N. H. J. Vol. XIII, pp* 372 *and* 616; *Wall, Bomb. N. H. J. Vol. XVIII, pp* 324 *and* 779; *l. c. Vol. XX, pp* 279 *and* 948.

Length.—934 mm. (3 feet, ¾ of an inch).

Lepid.—Ventrals. 201 to 213. Subcaudals. 74 to 94.

Distn.—*East Himalayas.* Darjeeling Dist. (Ind. Mus.) Mungpoo. (F. W.) *Assam.* Tezpur. (Ind. Mus.) Khasi Hills. *Burma.* As far North as Mansi and Sima. (Lat. 25o. Long. 97°. F.W.). Chin Hills. Shan States. (Mogok. Maymyo. Taunggyi. F. W.) *Siam.* In the Peninsula N. of Kra. *China.* Yunnan.

Note.—I have examined a young example in the British Museum labelled *L. gammiei* by Mr. Boulenger, in which the costals are 17 in midbody, ventrals 208, and subcaudals 91, which emphasises the close resemblance of this species to *Dinodon gammiei.* (*Vide* note on that species.)

130. (*Nil.*) **Ophites mackinnoni** (Wall.) *Mackinnon's Wolf Snake.*

Lycodon mackinnoni. *Wall, Bomb. N. H. J. Vol XVII, p* 29.

Type.—From Mussoorie. Preserved in the British Museum.

Length.—387 mm. (1 foot, 3¼ inches).

Lepid.—Ventrals. 164 to 184. Subcaudals. 47 to 57.

Distn.—*Western Himalayas.* Mussoorie. Almora. Muktesar. Near Naini Tal.

Note.—I have now seen eleven specimens.

Genus.—CERCASPIS *Dumeril and Bibron.*

1820 Hurria. (*non Daudin* 1803.) *Kuhl, Beitr. Zool. Verg. Anat, p* 95.

1837 Lycodon. (*non Ferrusac,* 1826.) *Schlegel, Phys. Serp. II, p* 109, *pl IV, figs* 6 *and* 7.

1854 Cercaspis. (*non Wagler,* 1830.) *Dumeril and Bibron, VII, p* 390.

131. (356) **Cercaspis carinatus** (Kuhl.) *The Ceylon Wolf Snake.*

Lycodon carinatus. *Boulenger, Faun. Brit. Ind. Rept.* 1890, *p* 297 *Cat. Vol. I,* 1893, *p* 358; *Sarasin, Zool. Jahr. Jena.* 1910, *p* 127 *Willey, Spol. Zeylan.* 1906, *p* 233.

Cercaspis carinatus. *Wall, Spol. Zeylan.* 1921, *pp* 399 *and* 404. *Oph. Tap.* 1921, *p* 162.

Length.—730 mm. (2 feet, 4¾ inches).

Lepid.—Ventrals. 188 to 198. Subcaudals. 51 to 64. Costals. Two heads-lengths behind the head 17, midbody 19, two heads-lengths before the vent 17.

Distn.—*Ceylon.* Plains and up to 3,000 feet.

Note.—My reasons for removing this species from the genus *Ophites* are given in Spolia Zeylanica, 1921, p 404.

Genus.—DINODON *Dumeril and Bibron.*

132. (355) **Dinodon gammiei** (Blanford). *Gammie's Wolf Snake.*

Lycodon fasciatus. *D'Abreu, Bomb. N. H. J. Vol. XX, p* 857 ; *l. c. Vol. XXI, p* 1335.

Lycodon gammiei. *Boulenger, Cat. Vol. I,* 1893, *p* 358 ; *Sarasin, Zool. Jahr. Jena.* 1910, *p* 146 ; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 15 ; *Wall, Bomb. N. H. J. Vol. XXI, p* 279.

Type.—From Darjeeling Dist. in the Indian Museum.

Length.—1,118 mm. (3 feet, 8 inches).

Lepid.—Costals. At midbody 17 or 19. Ventrals. 206 to 222. Subcaudals. 98 to 105.

Distn.—*Eastern Himalayas.* Darjeeling Dist. (Ind. Mus.) Kurseong. (D'Abreu.)

Note.—I have examined the type (No 8447 in the Indian Museum) and count the ventrals 222, and the subcaudals 100 in pairs. The costals are 17 anteriorly for about six heads-lengths, then become 19 and remain 19 till behind midbody, when they become 17, and later reduce to 15. In this feature I believe the specimen will prove aberrant. A second specimen (No 17129 in the Indian Museum) has the costals in 17 rows to well behind midbody. I count the ventrals 207, and the subcaudals 105. The species is extremely like *Ophites fasciatus* in almost every detail, but I am satisfied is not only distinct but should be placed in the genus *Dinodon.* I find that in both the specimens referred to, the praecranterian teeth are small and number 2. The cranterian number 3 and progressively reduce in size, the first of the 3 being considerably larger than the praecranterian. This is the arrangement of the teeth in three other species of *Dinodon* of which I have skulls, *viz., septentrionalis, rufozonatus* and *semicarinatus.* In the genus *Ophites* there are 2 small praecranterian teeth. The cranterian number 2 only, the posterior being the shorter. In this respect my four skulls of *fasciatus* agree with other *Ophites.* I have skulls of 7 species. The specimen referred to by D'Abreu as *Ophites fasciatus* was submitted to me for examination, and proves to be this species. I have seen four examples.

133. (353) **Dinodon septentrionalis** (Günther.) *Jerdon's Wolf Snake.*

Sub-species.—Dinodon septentrionalis septentrionalis *Gunther.*

Bungarus bungaroides. *Sclater, List. Sn. Ind. Mus.* 1891, *p* 58. (*part, No* 7741).

Lycodon septentrionalis. *Boulenger, Faun. Brit. Ind. Rept.* 1890, *p* 295.

Dinodon septentrionalis. *Boulenger, Cat. Vol. I,* 1893, *p* 363 ; *l. c. Vol. III,* 1896, *p* 619 ; *Bomb. N. H. J. Vol. XVI, p* 235 ; *Wall, P. Z. S.* 1903, *p* 90 ; *Bomb. N. H. J. Vol. XVIII, p* 778 ; *Rec. Ind. Mus.* 1909, *p* 621.

Length.—1,020 mm. (3 feet, 4 ⅛ inches).

Lepid.—Ventrals. 207 to 217. Subcaudals. 81 to 92.

Distn.—*Eastern Himalayas.* Darjeeling Dist. (Ind. Mus.). Phoobsering, below Darjeeling. (F. W.) *Assam.* Namsang. Lat. 27°. Long. 95·5°. (F. W.) *Burma.* Mogok, Ruby mines. (Boulenger.) Karen Hills. (Brit. Mus.) *S. China.* Kuatun, Fokien. (Boulenger.) Hills N. of Kiukiang. (Brit. Mus.)

Genus.—DRYOCALAMUS *Günther.*

134. (357) **Dryocalamus nympha** (Daudin.) *The Bridal Snake.*

Hydrophobus nympha. *Boulenger, Faun. Brit. Ind. Rept.* 1890, *p* 298 ; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 16.

Dryocalamus nympha. *Boulenger, Cat. Vol. I,* 1893, *p* 370; *Ferguson, Bomb. N. H. J. Vol. X, p* 71 ; *Sarasin, Zool. Jahr. Jena.* 1910, *p* 128 ; *Wall, Bomb. N. H. J. Vol. XIX, p* 287 ; *Spol. Zeylan.* 1921, *p* 399 ; *Oph. Tap.* 1921, *p* 166 ; *Willey, Spol. Zeylan.* 1906, *p* 233.

Length.—508 mm. (1 foot, 8 inches).

Distn.—*Ceylon. Peninsular India.* As far North as the Balarangam Hills on the Western side and Orissa (Rumbha. F. W.) on the Eastern.

135. (359) **Dryocalamus davisoni** (Blanford.) *Davison's Bridal Snake,*

Hydrophobus davisoni. *Boulenger, Faun. Brit. Ind. Rept.* 1890. *p* 299 , *Sclater, List. Sn. Ind. Mus.* 1891, *p* 16 (*part, No* 3201).

Dryocalamus davisoni. *Boulenger, Cat. Vol. I,* 1893, *p* 372.

Length.—700 mm. (2 feet, 3½ inches).

Distn.—*Burma.* Tenasserim. (Nawlabu Hill. E. of Tavoy. Ind. Mus.). *Siam. Indo-China.*

136. (358) **Dryocalamus gracilis** (Günther.) *The Scarce Bridal Snake.*

Hydrophobus gracilis. *Boulenger, Faun. Brit. Ind. Rept.* 1890, *p* 298,

Hydrophobus davisoni. *Sclater, List. Sn. Ind. Mus.* 1891, *p* 16 (*part. No* 8690).

Dryocalamus gracilis. *Boulenger, Cat. Vol. I,* 1893, *p* 371 ; *Sarasin*; *Zool. Jahr. Jena.* 1910, *p* 128 ; *Wall, Rec. Ind. Mus.* 1909, *p* 147. *Bomb. N. H. J Vol. XIX, p* 290 ; *Oph. Tap.* 1921, *p* 169 ; *Willey, Spol. Zeylan.* 1906, *p* 233.

Length.—607 mm. (1 foot, 11⅞ inches.)

Lepid.—Ventrals. 199 to 243. Subcaudals. 75 to 87. Anal. Sometimes divided.

Distn.—*Ceylon. Peninsular India.* Anamalais and Cuddapah Hills (Brit. Mus.) Berhampore, Orissa. (F. W.).

Note.—Specimen No 8690 of Sclater's list is undoubtedly this species. The costals are in 15 rows. Ventrals. 236. Anal. Divided, (and in this feature aberrant). Subcaudals. 85. I support Sclater in the doubt he has raised to the locality of this specimen (labelled False Island, Arrakan ?).

Genus.—PTYAS *Fitzinger.*

1758 Coluber. *Linné, part, Syst. Nat. I, p* 226 (*type C berus*).
1768 Natrix. *Laurenti, part, Syn. Rept. I, p* 388 [*type N natrix* (*Linne.*)]
1843 Ptyas. *Fitzinger, Syst. Rept., p* 26 [(*type Coluber blumenbachi*) = *P mucosus* (*Linné*)].
1854 Coryphodon. *Dumeril and Bibron, part, Erp. Gen. VII, p* 180.
1854 Ablabes. *Dumeril and Bibron, part. Erp. Gen. VII, p* 326
1860 Zaocys. *Cope, Proc. Ac. Philad, p* 563 [*type Z dhumnades* (*Cantor.*)]
1860 Leptophis. (*non Dumeril and Bibron,* 1854). *Hallowell, Proc. Ac. Philad. p* 503.
1864 Zapyrus. *Günther, Rept. Brit. Ind., p* 256 (*type Z fuscus*).
1890 Zamenis. *Boulenger, part. Faun. Brit. Ind. Rept.* 1890, *p* 324.

137 (397) **Ptyas mucosus** (Linné.) *The Dhaman or Common Rat Snake;*
Zamenis mucosus. *Abercromby, Sn. of Ceylon,* 1910 ; *pp* 47, 63 *and* 73 ; *Spol. Zeylan.* 1911, *p* 205 ; *l. c.* 1913, *p* 145 ; *Alcock and Rogers P.R. Soc.* 1902, *p* 451; *Annandale, J. A. S., Beng,* 1905, *p* 175; *Rec. Ind. Mus.* 1912, *pp* 37, 48 *and* 53 ; *Beadon, Bomb. N. H. J. Vol. XX, p* 228. *Boulenger, Cat. Vol I,* 1893, *p* 385 ; *l. c. Vol. III.* 1896, *p* 621 ; *D'Abreu, Bomb. N. H. J. Vol. XXI, p* 1099 ; *l.c. Vol. XXIV, p* 753. *Fenton, Bomb. N. H. J. Vol. XIX, p* 1002; *Ferguson, Bomb. N. H. J. Vol. X, p* 71 ; *Gleadow, Bomb. N. H. J. Vol. XVII, p* 245 ; *Kelsall, Bomb. N. H. J. Vol. XII, p* 783 ; *Millard, Bomb. N. H. J. Vol. XV. p* 348 ; *l. c. Vol. XVII, p* 245 ; *Millett, Bomb. N. H. J. Vol. XIX, p* 759 ; *Mullan, Bomb. N. H. J. Vol. XVIII, p* 919 ; *Pearless* ; *Spol. Zeylan.* 1909, *p* 54 ; *Sarasin, Zool. Jahr. Jena.* 1910, *p* 132 ; *Sclater, List. Sn. Ind. Mus.* 1891 *p* 26 ; *Sundara Raj, Bomb. N. H. J. Vol. XXIII, p* 789 ; *Venning, Bomb. N. H. J. Vol. XX, p* 339; *Wall and Evans, Bomb. N. H. J. Vol. XIII, pp* 353 *and* 620; *Wall, Spol. Zeylan.* 1905, *p* 3; *Bomb. N. H. J. Vol. XVI, pp* 298 *and* 393 ; *l.c. Vol XVII, pp* 259, 1017, *and* 1033 *l. c. Vol. XVIII; pp* 113 *and* 157 ; *l.c. Vol. XIX, pp* 267, 345, 623 *and* 757 ; *l. c. Vol. XXI, pp* 134 *and* 1034 ; *l. c. Vol. XXIII, p* 168 ; *Willey, Spol. Zeylan.* 1906, *p* 233.

Zaocys mucosus. *Wall Bomb. N. H. J. Vol. XXIII, p* 168; *l.c. Vol. XXVI, p* 566 ; *Spol. Zeylan.* 1921, *p* 399.

Ptyas mucosus. *Wall, Oph. Tap.* 1921. *p* 172.

Length.—3,583 mm. (11 feet, 9 inches).

Lepid.—Ventrals. 180 to 213. Subcaudals. 95 to 146.

Distn.—*Ceylon. Peninsular India.* To the Himalayas. *Sind. Baluchistan. Afghanistan. Transcaspia. Assam.* North and South of the Bramaputra. *Burma. Andamans. Malay Peninsula. Indo-China. S. China.* Including neighbouring Islands and Formosa. *Malay Archipelago.* Java.

Note.—In the Bombay Natural History Journal Vol. XXIII, p 168, I gave reasons for removing *mucosus* (Linné) from the genus *Zamenis,* and included it with the genus *Zaocys,* but Cope's *Zaocys* 1860, is antedated by Fitzinger's *Ptyas.* 1843. All the six species referred to in Boulenger's Catalogue under *Zaocys* (Vol I, p 374) must now be grouped with *mucosus* under the name *Ptyas.*

138. (405) **Ptyas nigromarginatus** (Blyth.) *Blyth's Rat Snake.*

Annandale, Rec. Ind. Mus. 1911, *p* 217 ; *Boulenger, Cat. Vol. I,* 1893 *p* 376 ; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 29 ; *Wall, Bomb. N. H. J. Vol. XVIII, p* 325 ; *l.c. Vol. XIX, pp* 344 *and* 621.

Length.—2,363 mm. (7 feet, 9 inches.) (Blyth).

Lepid.—Ventrals. 189 to 205. Subcaudals. 120 to 142.

Distn.—*Eastern Himalayas.* Nepal to Sikkim. *Assam.* Khasi Hills. Naga Hills. (Kohima, F. W.) *China.* Yunnan. (Lu-shui-ho, Su-chuan Province. Annandale).

139. (*Nil.*) **Ptyas tenasserimensis** (Sclater.) *Sclater's Rat Snake.*

Boulenger, Cat. Vol. I, 1893, *p* 378 ; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 30.

Type.—In the Indian Museum from Tenasserim.

Distn.—*Burma.* Tenasserim.

Note.—Known from a single specimen in the Indian Museum.

Genus—ZAMENIS *Wagler.*

140. (396) **Zamenis korros** (Schlegel.) *Schlegel's Rat Snake.*

Zamenis korros. *Boulenger, Cat. Vol. I,* 1893, *p* 384 ; *l.c. Vol. III* 1896, *p* 621 ; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 26 ; *Wall and Evans, Bomb.N. H. J. Vol. XIII, pp* 353 *and* 620. ; *Wall, Bomb. N. H. J. Vol. XVIII, p* 326 ; *l. c. Vol. XIX, pp* 345 *and* 622.

Length.—2,198 mm. (7 feet, 2½ inches).

Lepid.—Ventrals. 160 to 187. Subcaudals. 120 to 147.

Distn.—*Eastern Himalayas. Assam.* North and South of the Bramaputra. *Eastern Bengal.* Chittagong. (Ind. Mus.) *Burma.* Plains and Hills. Shan States. (Lashio. Bombay colln.) Tenasserim. (Ind. Mus.) *Malay Peninsula. Siam. Indo-China. China.* Yunnan. South ; Provinces, and neighbouring Islands. *Malay Archipelago.* Sumatra. Java. *Formosa ?*

141. (398, 399) **Zamenis ventrimaculatus** (Gray) *Gray's Rat Snake.*

Zamenis rhodorhachis. *Alcock and Finn, J. A. S., Beng.,* 1896, *p* 563, *Annandale, J.A.S., Beng.,* 1904, *p* 209. *Boulenger. Cat. Vol. I.* 1893, *p* 398 ; *l. c. Vol. III,* 1896, *p* 623; *P. Z. S.* 1919, *p* 301; *Wall, Bomb. N. H. J. Vol. XVIII, p* 798 ; *l. c. Vol. XXI, pp* 134 *and* 1035.

Zamenis ventrimaculatus. *Boulenger, Cat. Vol. I,* 1893, *p* 399 ; *l. c. Vol. III,* 1896, *p* 623; *Sarasin, Zool. Jahr. Jena.* 1910, *p* 143; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 27; *Wall, Bomb. N. H. J. Vol. XXIII, p* 38.

Zamenis ladacensis. *Sclater, List. Sn. Ind. Mus.* 1891, *p* 27.

Length.—1,232 mm. (4 feet and ½ an inch).

Lepid.—Ventrals. 199 to 246. Subcaudals. 82 to 145.

Distn.—*Africa.* Egypt to Somaliland. *Arabia.* From Mesopotamia in the North to Aden Hinterland in the South. *Persia. Transcaspia. Afghanistan. N. W. India. Baluchistan. Chitral. Gilgit. Ladak. Sind. Punjab. Peninsular India.* Rajputana. Gujerat. (Deesa. Bombay colln.) Bombay Pres. (Khandesh. Deolali. Bombay colln. *Western Himalayas.* As far East as Lamgarrah, Almora District (F. W.)

Note.—I cannot separate this species from *rhodorhachis* Jan. It is as variable in colouration as *Z diadema,* but I do not think these varieties deserve recognition as subspecies.

142. (400) **Zamenis karelini** (Brandt.) *Karelin's Rat Snake.*

Annandale, J. A. S., Beng., 1904, *p* 209; *Alcock and Finn, J. A. S. Beng.* 1896, *p* 563; *Boulenger, Cat. Vol. I,* 1893, *p.* 401; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 28; *Wall, Bomb. N.H.J. Vol. XX, p* 1035.

Lepid.—Ventrals. 192 to 213. Subcaudals. 92 to 111.

Distn.—*Transcaspia. Turkestan. Persia. Afghanistan. Baluchistan.*

143. (401) **Zamenis gracilis** (Günther.) *Günther's Rat Snake.*

Boulenger, Cat. Vol. I, 1893, *p* 404 ; *l. c. Vol. III,* 1896, p 624.

Distn.—*Peninsular India.* Bombay, Poona. (Murray.) Satara. Asirgarh, Lat. 21·5° Long. 76·2° (Bombay colln.) *Sind.* (Murray.)

144. (*Nil.*) **Zamenis florulentus** (Geoffrey.) *Geoffrey's Rat Snake.*

Boulenger, Cat. Vol. I, 1893, *p* 402 ; *l. c. Vol. III, p* 624; *P. Z. S.* 1919, *p* 302; *Wall, Bomb. N. H. J. Vol. XVIII, p* 689.

Distn.—*N. E. Africa.* Egypt to Somaliland. *Baluchistan.* Quetta. (F. W.)

145. (402) **Zamenis fasciolatus** (Shaw.) *The Fasciolated Rat Snake.*

Boulenger, Cat. Vol. I, 1893, *p* 404 ; *Sarasin, Zool. Jahr. Jena.* 1910, *p.* 131; *Sclater. List. Sn. Ind. Mus.* 1891, *p* 28; *Wall, Bomb. N. H. J. Vol. XVIII, p* 115 ; *l. c. Vol. XXIII, p* 34; *Oph. Tap.* 1921, *p* 191; *Willey, Spol. Zeylan.* 1906, *p* 233.

Lepid.—Ventrals. 191 to 232.

Distn.—*Ceylon. Peninsular India.* To the base of the Himalayas. To Calcutta in the N. East. To the Punjab in the N. West. (Ambala. Bombay colln.)

Note.—I doubt its occurrence in the Malay Peninsula for reasons cited in the note to *Typhlops bothriorhynchus* (q.v.).

146. (*Nil.*) **Zamenis ravergieri** (Menetries.) *Ravergier's Rat Snake.*

Boulenger, Cat. Vol. I, 1893, *p* 405 ; *l. c. Vol. III,* 1896, *p* 625; *Sclater. List. Sn. Ind. Mus.* 1891, *p* 29; *Wall, Bomb. N.H.J. Vol. XXI, pp* 137 *and* 1036.

Distn.—*Transcaucasia. Transcaspia. Turkestan. Persia. Afghanistan, Baluchistan* (F. W.) *Chitral.* (F. W.) *N. W. Frontier.* (Paiwar Kotal. F. W.)

147. (403) **Zamenis diadema** (Schlegel.) *The Royal Rat Snake.*

Annandale, J. A. S.. Beng., 1904, *p* 208; *Boulenger, Cat. Vol. I* 1893, *p* 411 ; *l. c. Vol. III,* 1896, *p* 265; *P. Z. S.* 1919, *p* 302; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 28; *Wall, Bomb. N. H. J. Vol. XXI, pp* 138 *and* 1036 ; *l. c. Vol. XXIII, p* 210.

Distn.—*N. Africa.* Algeria to Egypt. *Arabia. Persia. Turkestan. Afghanistan. Baluchistan. N. W. India. Chitral, N. W. Frontier. Punjab., Peninsular India.* Rajputana. As far South as Cutch. (Bhuj. Bombay colln.) and Guzerat. (Ahmedabad. Bombay colln.) As far East as Farukhabad, U.P. (F. W.)

148. (404) **Zamenis arenarius** Boulenger. *Murray's Rat Snake.*

Boulenger, Cat. Vol. I, 1893, *p* 413.

Distn.—*N. W. India.* Sind. Rajputana.

Genus—LYTORHYNCHUS *Peters.*

149. (*Nil*) **Lytorhynchus ridgewayi** Boulenger. *Ridgeway's Desert Snake.*

Alcock and Finn, J. A. S., Beng. 1896,, *p* 562; *Annandale, J. A. S., Beng.*, 1904, *p* 208; *Boulenger; Cat. Vol. I,* 1893, *p* 415; *Wall, Bomb. N. H. J. Vol XXI, p* 1037.

Lepid.—Ventrals. 171 to 185. Subcaudals. 42 to 52.

Distn.—*Transcaspia. Afghanistan. Baluchistan.* Man, Gusht, Kacha, Sib, Kanki. (Bombay colln.) Quetta. (F. W).

150. (395) **Lytorhynchus paradoxus** (Günther.) *Günther's Desert Snake,*

Boulenger, Cat. Vol I, 1893, *p* 416.

Distn.—*Sind. Punjab.* Multan. (Bombay colln.)

151. (*Nil.*) **Lytorhynchus maynardi** Alcock and Finn. *Maynard's Desert Snake.*

Alcock and Finn, J. A. S., Beng, 1896, *p* 562; *Annandale, J. A. S., Beng.*, 1904, *p* 208.

Type.—From near Probat, Perso-Baluch Frontier. Preserved in the Indian Museum. Co-type in the British Museum.

Lepid.—Costals. In 19 rows in midbody. Ventrals. 181 to 192. Ana Divided. Subcaudals. 55 to 58.
Distn.—Baluchistan.

Genus.—XENELAPHIS *Günther.*

152. (415) **Xenelaphis hexagonotus** (Cantor.) *Cantor's Rat Snake.*

Boulenger, Cat. Vol. II, 1894, *p* 8.
Distn.—Burma. Arakan. *Malay Peninsula. Malay Archipelago.* Sumatra Borneo. Java.

Genus.—COLUBER* *Linné.*

153. (413) **Coluber frenatus** (Gray.) *Gray's Coluber.*

Boulenger, Cat. Vol. II, 1894, *p* 58.
Distn.—Assam. Khasi Hills.

154. (412) **Coluber prasinus** Blyth. *Blyth's Coluber.*

Annandale, Rec. Ind. Mus. 1911, *p* 218 ; *Boulenger, Cat. Vol. II,* 1894, *p* 59; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 32; *Venning, Bomb. N. H J. Vol. XX, p* 337; *Wall, Bomb. N. H. J. Vol. XIX, pp* 346 *and* 825.
Lepid.—Ventrals. 191 to 209. Subcaudals. 91 to 110.
Distn.—Eastern Himalayas. Sikkim. *Assam.* Garo Hills. Khasi Hills. Naga Hills. (F. W.) *Burma.* As far North as Mansi† (Lat. 24·3°. Long. 96·3°. Bombay colln.) Bhamo. (Ind. Mus.) Chin Hills. N. Shan States. (Ruby Mines. Bombay colln.) S. Shan States. *China,* Yunnan. (Ind. Mus.)
†*Note.*—There is another Mansi (Lat. 24·7°. Long. 95·7°).

155. (373) **Coluber porphyraceus** Cantor. *The Broad-barred Coluber.*

Ablabes porphyraceus. *Annandale, Rec. Ind. Mus.* 1911, *p* 217 ; *l. c.* 1912, *pp* 37, 47 *and* 53 ; *Boulenger. Faun. Brit. Ind. Rept.* 1890, *p* 308; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 19; *Venning, Bomb. N. H. J. Vol. XX, p* 337; *Wall and Evans, Bomb. N.H.J. Vol. XIII, pp* 343 *and* 611.
Coluber porphyraceus. *Annandale, J. A. S., Beng.,* 1905, *p* 175 ; *Boulenger, Cat. Vol. II,* 1894, *p* 34; *Wall, Bomb. N. H. J. Vol. XVIII, p* 326 ; *l. c. Vol. XIX, pp* 345 *and* 827.
Length.—991 mm. (3 feet, 6 inches).
Lepid.—Ventrals. 190 to 218.
Distn.—Eastern Himalayas. Jalpaiguri Dist. Sikkim. *Assam.* Abor Hills. Sadiya. (F. W.) Sibsagar (Ind. Mus.) Garo Hills. Khasi Hills. Naga Hills. *Burma.* Kachin Hills. (Hotha., Ind. Mus. Sadon Lat. 24·7°. Long. 98°. Bombay colln.) Manipur. Chin Hills. S. Shan States. *Andamans.* (Annandale.) *China.* Yunnan. Fokien.
Note.—I do not credit its occurrence in the Malay Peninsula for reasons cited in the note to *Typhlops bothriorhynchus.* I cannot trace the authority for Sumatra, and also discredit this as a locality until confirmation.

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*Stejneger (Herp. Japan 1907, p 307) attempts to invalidate *Coluber* Linné. 1766, and substitute *Elaphe* Fitzinger 1833, on the representation that Linné did not cite a definite genotype, and Fleming in 1822, and Boie in 1826 selected as types species that were unknown to Linné. The matter should be referred to an International tribunal to decide, and until a decision has been given it would be unwise to change the name. (See also footnote to *Vipera.*)

156. (411) **Coluber melanurus** Schlegel. *Schlegel's Coluber.*

Annandale, J.A.S., Beng., 1905, *pp* 173 *and* 175; *Boulenger, Cat. Vol. II,* 1894, *p* 60; *Sarasin, Zool. Jahr. Jena.* 1910, *p* 145, *Sclater, List Sn. Ind. Mus.* 1891, *p* 32.

Lepid.—Subcaudals. 89 to 115.

Distn.—*Burma.* Tenasserim. (Mergui. Ind. Mus.) *Andamans. Nicobars. Malay Peninsula. Malay Archipelago.* Sumatra. Nias. Borneo. Java. *China ?*

Note.—Malcolm-Smith questions the authenticity of China.

157. (410) **Coluber radiatus** Schlegel. *The Copper-headed Coluber.*

Annandale, J. A. S., Beng., 1905, *p* 210; *Boulenger, Cat. Vol. II,* 1894, *p* 61; *Rec. Ind. Mus.* 1913, *p* 358; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 32; *Wall and Evans, Bomb. N. H. J. Vol. XIII, pp* 345 *and* 614; *Wall, Bom. N. H. J. Vol. XVIII, p* 327 ; *l. c. Vol. XIX, pp* 347. 757*a and* 825; *l. c. Vol XXIII, p* 206.

Length.—2,135 mm. (7 feet). (Rev. C. Leigh, S.J., in a letter to me from Kurseong, 21-7-09.)

Lepid.—Ventrals. 224 to 250. Subcaudals. 85 to 106.

Distn.—*Orissa.* Cuttack. (Ind. Mus.). *Bengal.* Backergunj. (Ind. Mus.) Kakina, Rungpore District. Cooch Behar. (Bombay colln.) *Eastern Himalayas.* Buxa Dooars. (F. W.) to Sikkim. *Assam.* As far North as Sadiya. (F. W.) Khasi Hills. Naga Hills. *Burma.* As far North as Monywa and Mandalay. S. Shan States. Tenasserim. *Malay Peninsula. Malay Archipelago.* Sumatra. Java. *Siam. Including Coastal Islands. Cochin China.* China. Southern Provinces and Coastal Islands.

158. (*Nil.*) **Coluber leonardi** Wall. *Leonard's Coluber.*

Wall, Bomb. N. H. J. Vol. XXVIII, p 43, *l. c. Vol. XXIX, p* 467.

Type.—From Sinlum Kaba. Now preserved in the British Museum.

Length.— 685 mm. (2 feet, 3 inches). Tail. 113 mm. (4½ inches).

Lepid.—Costals. Two heads-lengths behind the head 19, midbody 19, two heads-lengths before the vent 17. Ventrals. 205 to 223? Anal. Divided. Subcaudals. 50 to 56 divided.

Distn.—*Burma.* Sinlum Kaba (Lat. 24°. Long. 97·5°). *Assam.*

159. (407) **Coluber cantoris** Boulenger. *Cantor's Coluber.*

Coluber reticularis. *Boulenger, Faun. Brit. Ind. Rept.* 1890, *p* 332 ; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 31.

Coluber cantoris. *Boulenger, Cat. Vol. II,* 1894, *p* 35 ; *Wall, Bomb. N. H. J Vol. XIX, pp* 345 *and* 898.

Length.—1,372 mm. (4 feet, 6 inches).

Lepid.—Ventrals. 213 to 236. Subcaudals. 65 to 88.

Distn.—*Eastern Himalayas.* Nepal to Sikkim. *Assam.* Garo Hills. Khasi Hills. *Burma ?*

Note.—The localities Pegu and Ramri Island (Ind. Mus.) seem to me to call for confirmation.

160. (*Nil.*) **Coluber pavo** (Annandale.) *Annandale's Coluber.*

Ablabes pavo. *Annandale, Rec. Ind. Mus.* 1912, *pp* 37, 47 *and* 53 ; *Prater, Bomb. N. H. J. Vol. XXVI, p* 683.

Coluber pavo. *Wall, Bomb. N. H. J. Vol XXVI, p* 865.

Type.—From Abor Hills, preserved in the Indian Museum.

Length.—1740 mm. (5 feet, 8½ inches). Tail. 330. mm (1 foot, 1 inch).

Lepid.—Costals. In 21 rows in midbody (not 19). Ventrals. 225 to 238. Subcaudals. 80.

Distn.—*Assam.* Abor Hills. (Rotung. Ind. Mus. Type.) *Burma,* Kindat. (Lat. 23·8°. Long. 94·5°. Konglu. Lat. 27·20. Long. 97·50. Bombay colln.)

Note.—I find the scales 21 in midbody in the type and two others.

161. (408) **Coluber hodgsoni** (Günther.) *Hodgson's Coluber.*

Boulenger, Cat. Vol. II, 1894, *p* 35; *Sarasin, Zool. Jahr Jena.* 1910, *p* 146; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 31.

Length.—1,614 mm. (5 feet, 3½ inches).

Lepid.—Costals. 23 (rarely 21) in midbody. Ventrals. 233 to 247. Subcaudals. 79 to 92.

Distn.—*Himalayas.* From Ladak and Kashmir (Srinagar. Bombay colln.) to Sikkim. *Assam.* Garo Hills. (Ind. Mus.).

Note.—Flower very properly questions the authenticity of Hanitsch's record of this species from Singapore.

162. (409) **Coluber tæniurus** (Cope.) *Cope's Coluber.*

Coluber tæniurus. *Annandale, Rec. Ind. Mus.* 1911, *p* 217; *l. c.* 1912, *pp* 37, 48 *and* 53; *Boulenger, Cat. Vol. II,* 1894, *p* 47; *l. c. Vol. III,* 1896, *p* 627; *Butler, Bomb. N. H. J. Vol. XII, pp* 424 *and* 425; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 31; *Venning, Bomb. N.H.J. Vol. XX, p* 338; *Wall, Bomb. N.H.J. Vol. XIX, p* 346.

Length.—1,677 mm. (5 feet, 6 inches).

Lepid.—Ventrals. 230 to 235. Subcaudals. 90 to 107.

Distn.—*Eastern Himalayas. Assam.* Abor Hills. *Burma.* Chin Hills. *China.* Yunnan. (Ind. Mus.) Yangtse Valley to Pekin. *Formosa. Korea. Manchuria. Amur.*

Note.—Stejneger (Herp. Japan 1907, p 319) points out that the specimens from Siam, Malay Peninsula, Borneo, and Sumatra recorded as *tæniurus* conform to a type specifically distinct from this species, *viz., grabowskyi* Fischer. With this opinion I fully concur.

163. (414) **Coluber oxycephalus** Boie. *Boie's Coluber.*

Herpetodryas prasinus. *Blyth, Andaman Islanders, p* 365; *J. A. S., Beng., Vol. XXIII, p* 291.

Coluber oxycephalus. *Annandale, J. A. S. Beng.* 1905, *p* 175; *Boulenger, Cat. Vol. II,* 1894, *pp* 56 *and* 357; *l. c. Vol. III,* 1896, *p* 627; *Sarasin, Zool. Jahr. Jena.* 1910, *p* 145; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 33; *Wall and Evans, Bomb. N. H. J. Vol. XIII, p* 614.

Lepid.—Subcaudals. 121 to 157.

Distn.—*Eastern Himalayas.* Darjeeling (Dist. ? Ind. Mus.). *Burma.* Pegu. (Ind. Mus.) Tenasserim. *Andamans. Nicobars. Malay Peninsula. Siam.* Peninsula N. of Kra. (Malcolm-Smith) *Malay Archipelago.* Borneo. Java. *Philippines.*

64. (406) **Coluber helena** Daudin. *Daudin's Coluber, or the Trinket Snake.*

Boulenger, Cat. Vol. II, 1894, *pp* 36 *and* 357; *Ferguson, Bomb. N. H. J. Vol. X, p* 72; *Pearless, Spol. Zeylan.* 1909, *p* 54; *Sarasin. Zool. Jahr. Jena.* 1910, *p* 130; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 31; *Wall, Bomb. N. H. J. Vol. XVI, p* 394; *l. c. Vol. XIX, p* 757; *l.c. Vol. XXII, p* 22; *l. c. Vol. XXVI, p* 566; *Spol. Zeylan.* 1921, *p* 399; *Oph. Tap.* 1921, *p* 197; *Willey, Spol. Zeylan.* 1906, *p* 233.

Length.—1,601 mm. (5 feet, 3 inches).

Lepid.—Ventrals. 217 to 265. Subcaudals. 73 to 100.
Distn.—*Ceylon. Peninsular India.* To Sind in the North-West, and Jalpaiguri Dist. in the North-East. *Western Himalayas.* Almora District. (F W.) *Assam.* Naga Hills. (Samaguting. Ind. Mus.)

Genus—DENDROPHIS *Boie.*

165. (420) **Dendrophis caudolineolatus** Günther. *Günther's Bronze-back.*

Dendrophis caudolineolatus. *Boulenger, Cat. Vol. II, p* 85; *Ferguson, Bomb. N. H. J. Vol. X,* 1895, *p* 72; *Sarasin, Zool. Jahr. Jena.* 1910, *p* 128; *Wall, Rec. Ind. Mus. Aug.* 1921, *p* 151; *Rec. Ind. Mus. Aug.* 1921, *p* 218.
Dendrophis caudolineatus. *Willey, Spol. Zeylan,* 1903, *p* 86; *l. c.* 1906, *p* 233.
Length.—876 mm. (2 feet, 10½ inches).
Lepid.—Ventrals. 149 to 164. Subcaudals. 119 to 128.
Distn.—*S. India.* Ramnad (Ind. Mus.). Travancore. (Ferguson.) *Ceylon.*
Note.—I have examined all the Indian specimens referred to.

166. (*Nil.*) **Dendrophis effrenis** Werner. *Werner's Bronze-back.*

Dendrophis effrenis. *Werner, Rept. Nat. Hist. Mus., Hamburg,* 1909, *p* 221; *Wall, Rec. Ind. Mus. Aug.* 1921, *p* 152; *Oph. Tap.* 1921, *p* 219.
Type.—From Ceylon. Preserved in the Hamburg Natural History Museum.
Length.—884 mm. (2 feet, 10¾ inches).
Lepid.—Costals. In 13 rows in midbody. Ventrals. 175. Subcaudals. 129. Loreal. none.
Distn.—*Ceylon.* Acquired from Mr. John Hagenback, said to be from Colombo.
Note.—May prove to be an example of *D. caudolineolatus* aberrant in that it has no loreal, as I have seen a specimen with the loreal confluent with the praefrontal on one side. Boulenger (Cat. Vol. III, p 630) records a similar anomaly in a specimen of *D. tristis.*

167. (*Nil.*) **Dendrophis gorei** Wall. *Gore's Bronze-back.*

Dendrophis pictus. *Sclater, List. Sn. Ind. Mus.* 1891, *p* 34 (*part Nos* 3945, 4042, 7703, 7705, 7707 *and* 7736).
Dendrophis gorei. *Annandale, Rec. Ind. Mus.* 1912, *pp* 37, 48 *and* 53 (*part No* 16871 *from Kobe*); *Wall, Bomb. N. H. J. Vol. XIX, p* 829; *l. c. Vol. XXII, p* 639; *Rec. Ind. Mus. Aug.* 1921, *p* 153.
Types.—From Namsang, Jaipur at the base of the Naga Hills. Preserved in the British Museum.
Length.—825 mm. (2 feet, 8½ inches).
Lepid.—Costals. In 13 rows in midbody. Ventrals. 187 to 199. Anal. divided. (Rarely entire.) Subcaudals. 139 to 153.
Distn.—*Eastern Himalayas.* Darjeeling Dist. (Nos 7703, 7705, 7736. Ind. Mus.). *Assam.* Kobe. Abor Expedn. (No 16871. Ind. Mus.) Dibrugarh (F. W.). Sibsagar (No 4042. Ind. Mus.). Garo Hills (No 3945. Ind. Mus.), Naga Hills. (Jaipur. F. W. Samaguting. No 7707 Ind. Mus.) *Burma.* S. Shan States (Taunggyi. Bombay colln.).

168. (417) **Dendrophis pictus** (Gmelin) *Gmelin's Bronze-back.*

Dendrophis pictus. *Annandale, J. A. S., Beng.,* 1905, *pp* 174 *and* 175; *Blyth, Andaman Islanders, pp* 365 *and* 366; *Boulenger, Cat. Vol. II,* 1893, *pp* 78 and 358; *Sarasin. Zool. Jahr. Jena.* 1910, *p* 131;

Sclater, List. Sn. Ind. Mus. 1891, *p* 34 (*part, Nos* 4074, 4483, 4484, 4485, 4486, 4487, 4489, 4490, 4491, 4492, 4493, 4494, 7682; 7683, 7686, 7687, 7691, 7692, 7696, 7698, 7700, 7701, 7704, 7706, 7709, 7710, 7711, 7712, 7714, 7718, 7734, 7735 7886, 8614, 8886, 8894, 8897, 8898, 12542); *Wall and Evans, Bomb. N. H. J. Vol. XIII, pp* 345 *and* 615; *Wall, Bomb. N. H. J. Vol. XVIII, p* 189; *l. c. Vol. XIX, pp* 347, 787 *and* 827; *l. c. Vol. XXV, p* 509; *Rec. Ind. Mus. Aug.* 1921, *p* 153.

Dendrophis gori. *Annandale, Rec. Ind. Mus.* 1912, *pp* 37, 48 *and* 53 (*part, Nos* 16836 *and* 16993).

Length.—1,220 mm. (4 feet).

Lepid.—Costals. In 15 rows in midbody. Ventrals. 173 to 211. Subcaudals. 119 to 164.

Distn.—*Western Himalayas*? Kathgodam. (F. W.) (Stoliczka.). *Eastern Himalayas.* Sikkim. *Assam,* Plains and Hills. *Burma.* As far North as Sima. (Lat. 25°. Long. 96°. Bombay colln.) S. Shan States. (Taunggyi. Bombay colln.) Tenasserim. *Andamans. Nicobars. Malay Peninsula. Siam. Indo-China. China*? (Hongkong. ? F. W.) *Malay Archipelago.* Sumatra. Further East to Philippines.

Note.—It is not certain whether it is this snake or *D. tristis,* Stoliczka refers to from the Western Himalayas, and there is a similar doubt with regard to the specimen I encountered at Kathgodam.

169. (416) **Dendrophis grandoculis** Boulenger. *Beddome's Bronze-back.*

D. grandoculis. *Boulenger, Cat. Vol. II,* 1893, *p* 84; *Ferguson, Bomb. N. H. J. Vol. X, p* 72; *Sarasin, Zool. Jahr. Jena.* 1910, *p* 138; *Wall, Rec. Ind. Mus. Aug.* 1921, *p* 156.

Lepid.—Costals. In 15 rows. Ventrals 167 to 188.

Distn.—*Hills of S. India.* South of the Goa gap. Tinnevelly. Travancore. (Brit. Mus.). Nilgiris. (Kollengode. Bombay colln.) Wynad. (Brit Mus.).

170. (*Nil.*) **Dendrophis proarchus** Wall. *Wall's Bronze-back.*

Dendrophis pictus. *Sclater, List. Sn. Ind. Mus.* 1891, *p* 34 (*part Nos* 3998, 4046, 6909, 7680, 7713, 7717, 11368); *Wall, Bomb. N.H.J. Vol. XVII,* p 189.

D. proarchos. *Wall, Bomb. N. H. J. Vol. XIX, pp* 827 *and* 898; *Rec. Ind. Mus. Aug.* 1921, *p* 157.

Types.—From Upper Assam, in the Bombay Natural History Museum.

Length.—1,296 mm. (4 feet, 3 inches).

Lepid.—Costals, 15 in midbody. Ventrals. 181 to 196. Subcaudals. 141 to 157. Anal. Entire.

Distn.—*N. E. India.* Upper Godavery Dist. (No 6909. Ind. Mus.) *Bengal.* Jalpaiguri Dist. (F. W.). Chittagong (F. W.) *Assam.* As far North as Sadiya. Sibsagar. Narainpur. Silchar. N. Cachar. Garo Hills. Naga Hills. (Ind. Mus.). *Burma.* Ramri Island, Arrakan. (Ind. Mus.). Upper Burma. (F.W.)

171. (419) **Dendrophis bifrenalis** Boulenger. *Boulenger's Bronze-back.*

Dendrophis bifrenalis. *Abercromby, Spol. Zeylan.* 1911, *pp* 205 *and* 207; *Boulenger, Cat. Vol. II.* 1893, *pp* 80 *and* 358; *Ferguson, Bomb. N.H.J. Vol. X, p* 72; *Sarasin, Zool. Jahr. Jena.* 1910, *p.* 128; *Wall, Bomb. N. H. J. Vol. XXII, p* 639; *Spol. Zeylan.* 1921, *pp* 399 *and* 406; *Rec. Ind. Mus. Aug.* 1921, *p* 158; *Oph. Tap.* 1921, *p* 215; *Willey, Spol. Zeylan.* 1904, *p* 116.

Lepid.—Ventrals. 154 to 176. Subcaudals. 144 to 165.
Distn.—*Western Ghats.* South of the Palghat gap. Travancore. (Ind. Mus. F. W.) *Ceylon.*

Genus—DENDRELAPHIS *Boulenger.*

172. (*Nil.*) **Dendrelaphis biloreatus** Wall. *The Biloreate Bronze-back.*
Wall, Bomb. N. H. J. Vol. XVIII, p 273 ; *l. c. Vol. XIX, p* 830; *Rec. Ind. Mus. Aug.* 1921, *p* 159.
Type.—From Sadiya, now in the British Museum.
Length.—699 mm. (2 feet, 3½ inches).
Lepid.—Costals. 13 in midbody. Ventrals. 192. Anal. Divided. Subcaudals. 147.
Distn.—*Assam.* Sadiya, on the North Bank of the Bramaputra.

173. (418) **Dendrelaphis subocularis** (Boulenger.) *Fea's Bronze-back.*
Dendrelaphis subocularis. *Boulenger, Cat. Vol. II, p* 89 ; *Malcolm Smith, Bomb. N. H. J.* 1915, *p* 785 ; *Wall, Rec. Ind. Mus. Aug.* 1921, *p* 159.
Dendrophis subocularis. *Sclater, List. Sn. Ind. Mus.* 1891, *p* 35.
Lepid.—Ventrals. 157 to 188.
Distn.—*Burma.* Bhamo. *Siam.* Fat Bua Kao. Bangkok. (Bombay colln.) Den Chai, Bangtophan, Sriracha-Koh-Lam Island. (Malcolm-Smith.) *Indo-China.* (Pavie Mission.)

174. (417) **Dendrelaphis tristis** (Daudin.) *Seba's Bronze-back.*
Dendrophis pictus. *Abercromby, Spol. Zeylan. Vol. IX, p* 146 ; *Sn. of Ceylon,* 1910, *pp* 45, 48 and 75 ; *Annandale, Mem. A.S., Beng., Vol. I, p* 194; *Boulenger, Cat. Vol. II,* 1893, *p* 337 (*part.*) ; *D'Abreu, Bom. N. H. J. Vol. XXV, p* 306 ; *Ferguson, Bomb. N. H. J. Vol. X, p* 73 ; *Green, Spol. Zeylan.* 1906, *p* 220 ; *Luard, B. N. H. Vol. XXV, p* 306; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 34 (*part. Nos* 7684, 7685, 7715, 7716, 7720, 7721 *and* 12952) ; *Wall, Bomb. N. H. J. Vol. XVI, p* 301 ; *Willey, Spol. Zeylan. Vol. I, p* 117 ; *l. c.* 1906, *p* 233.
Dendrelaphis tristis. *Boulenger, Cat. Vol. II,* 1893, *pp* 88 *and* 358 ; *l. c. Vol. III, p* 630; *Luard, Bomb. N.H.J. Vol XXV, p* 306; *Sarasin, Zool. Jahr. Jena.* 1910, *p* 131; *Wall, Bomb. N. H. J. Vol. XIX, pp* 347, 757 *and* 776; *l.c. Vol. XXVI, p* 567 ; *Spol. Zeylan.* 1921, *p* 406 ; *Rec. Ind. Mus. Aug.* 1921, *p* 160 ; *Oph. Tap.* 1921, *l.c.* 1910 *p* 35, *l.c.* 1921 *p* 221.
Length.—1,320 mm. (4 feet, 4 inches).
Lepid.—Ventrals. 163 to 205. Subcaudals. 110 to 150.
Distn.—*Ceylon. Peninsular India.* As far North as Sind (Brit. Mus.). *Bengal.* Jalpaiguri Dist. Kalna. (F. W.) *Eastern Himalayas.* Darjeeling Dist. *Burma.* Mergui (Nos. 7684 and 7685. Ind. Mus.).

174. (421) **Dendrelaphis caudolineatus** (Gray.) *Gray's Bronze-back.*
Note.—The occurrence of this species in India rests on the authority of Beddome. Two specimens in the British Museum are labelled "Wynad", donor Colonel Beddome. I discredit this locality for reasons stated in my note to *Natrix parallelus.*

Genus.—CORONELLA *Laurenti.*

175. (374) **Coronella brachyura** (Günther.) *Leith's Smooth Snake.*
Coronella brachyura. *Boulenger, Cat. Vol. II,* 1893, *p* 206 ; *Sarasin Zool. Jahr. Jena.* 1910, *pp* 140 *and* 145.
Length.—545 mm. (1 foot, 9½ inches).

Lepid.—Ventrals. 200 to 224. Subcaudals. 45 to 53.
Distn.—*Peninsular India.* Poona District. (No 11410. Ind. Mus.) Berar. (Wun. Lat. 20°. Long. 79°. No 7335. Ind. Mus.)
Note.—I have examined all the three known specimens.

Genus.—OLIGODON * *Boie.*

176. (385) **Oligodon planiceps** (Boulenger.) *Boulenger's Kukri Snake.*

Simotes planiceps. *Boulenger, Cat. Vol. II, p* 232 ; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 25.
Lepid.—Ventrals. 132 to 142. Subcaudals. 22 to 27.
Distn.—*Burma.* Minhla. (Lat. 20°. Long. 95°.)
Note.—A specimen in the Indian Museum is dubiously from Upper Burma or Yunnan.

177. (*Nil.*) **Oligodon herberti** Boulenger. *Hampton's Kukri Snake.*

Boulenger, Bomb. N. H. J. Vol. XVI, p 235. *Wall. Bomb. N. H. J. Vol. XXVIII, p* 44 ; *l. c. Vol. XXIXX, p* 467.
Type.—In the British Museum from Mogok, Ruby Mines. Burma.
Length.—560 mm. (1 foot, 10 inches).
Lepid.—Costals. In 13 rows in the whole body length. Ventrals. 186 to 208. Subcaudals. 37 to 40.
Distn.—*Burma.* N. Shan States. (Mogok.) Sinlum Kaba. (Lat. 24°. Long. 97·5°. Bombay colln.)

178. (*Nil.*) **Oligodon mcdougalli** Wall. *McDougall's Kukri Snake.*

Wall, Bomb. N. H. J. Vol. XVI, p 251.
Type.—From Sandoway, in the British Museum.
Length.—350 mm. (1 foot, 1¾ inches).
Lepid.—Costals. 13 in the whole body length. Ventrals. 200. Anal. Divided. Subcaudals. 39, in pairs. Nasal. Entire. Loreal. Absent. Postocular. One.
Distn.—*Burma.* Sandoway.

179. (384) **Oligodon torquatus** (Boulenger.) *Fea's Kukri Snake.*

Simotes torquatus. *Boulenger, Cat. Vol. II, p* 232.
Length.—292 mm. (11½ inches).
Lepid.—Ventrals, 150 to 153 (144 to 159, Boulenger.)
Distn.—*Burma.* Between Lat. 24° and 26°, and East of Long. 96°. Bhamo. (Brit. Mus.) Myitkyina. (F. W.)
Note.—I have seen four specimens including the types. I count the ventrals in the types 153 and 150, and the subcaudals 31 and 29.

180. (*Nil.*) **Oligodon erythrorhachis** Wall. *The Red-spined Kukri Snake*

Wall, Bomb. N. H. J. Vol. XIX, p 923.
Type.—From Jaipur, Assam in the British Museum.
Length.—375 mm. (1 foot, 2¾ inches).
Lepid.—Costals. 15 to behind midbody, 13 two heads-lengths before vent. Ventrals. 154. Anal. Divided. Subcaudals. 46 to 64 ? divided. Nasal. Entire. Loreal. Absent. Temporal. One. Supralabials. 7, the 3rd and 4th touching the eye, 6th reaching edge of lip.
Distn.—*Assam.* Jaipur (Namsang at the foot of the Naga Hills).

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* In the Bombay Natural History Journal Vol. XIX. (Footnote, page 556) I have shown that the separation of the genus *Simotes* from *Oligodon* was based on faulty observations on the part of Günther, and later Boulenger. I can find no differences between the two of sufficient value to warrant their separation, and *Oligodon* has precedence dating from 1827. (*Simotes* Dumeril and Bibron, 1853).

181. (390) **Oligodon dorsalis** (Gray.) *Gray's Kukri Snake.*

Boulenger, Cat. Vol. II, 1894, *p* 241; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 25; *Venning, Bomb. N. H. J. Vol. XX, pp* 338 *and* 772; *Wall, Bomb. N. H. J. Vol. XVIII, p* 327.

Length.—508 mm. (1 foot, 8 inches).

Lepid.—Ventrals. 162 to 188. Subcaudals. 27 to 51.

Distn.—*Eastern Bengal.* Chittagong Hills. *Assam.* Garo Hills. (Ind. Mus.) Khasi Hills. Naga Hills. *Burma.* Chin Hills. (Mansi Lat. 24·8°. Long. 97·6°. Bombay colln.)

Note.—*Calmaria catenata.* Blyth, (J. A. S., Beng., XXIII, 1854, p 287) may prove to be this snake. I have known a specimen where the costals reduced to 13 at midbody.

182. (391) **Oligodon templetoni** Günther. *Templeton's Kukri Snake.*

O. templetoni. *Abercromby, Sn. of Ceylon,* 1910, *p.* 73; *Boulenger, Cat. Vol. II,* 1894, *pp* 241 *and* 359; *Sarasin, Zool. Jahr. Jena.* 1910, *p* 127; *Wall, Spol. Zeylan.* 1921, *p* 400; *Oph. Tap.* 1921, *p* 245; *Willey, Spol. Zeylan.* 1906, *p* 233.

Length.—292 mm. (11½ inches).

Lepid.—Ventrals. 127 to 152. Subcaudals. 20 to 34.

Distn.—*Ceylon.*

183. (392) **Oligodon sublineatus** Dumeril and Bibron. *Dumeril's Kukri Snake.*

O. sublineatus. *Abercromby, Sn. of Ceylon,* 1910, *p* 72; *Spol. Zeylan.* 1911, *p* 206; *Annandale, J. A. S., Beng.,* 1905, *p* 175; *Boulenger, Cat. Vol. II,* 1894, *p* 242; *l. c. Vol. III,* 1896, *p* 640; *Pearless, Spol. Zeylan.* 1909, *p* 54; *Sarasin, Zool. Jahr. Jena.* 1910, *p* 134; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 25; *Wall, Spol. Zeylan.* 1910, *p* 37; *l. c.* 1921, *p* 400; *Oph. Tap.* 1921, *p* 248; *Willey, Spol. Zeylan.* 1906, *p* 233.

Lepid.—Ventrals. 134 to 161. Subcaudals. 23 to 37.

Distn.—*Ceylon.*

Note.—I have examined de Roepstorff's specimen in the Indian Museum, and can confirm the identification, but I doubt the reported locality (Nicobars). See note to *Polyodontophis sagittarius.*

184. (393) **Oligodon ellioti** Günther. *Elliot's Kukri Snake.*

Boulenger, Cat. Vol. I, 1894, *p* 242; *Sarasin, Zool. Jahr. Jena.* 1910, *p* 138; *Wall, Bomb. N. H. J. Vol. XIX, p* 533.

Length.—343 mm. (1 foot, 1½ inches).

Lepid.—Ventrals. 149 to 152. Subcaudals. 29 to 31.

Distn.—*S. India.* No precise locality. *Ceylon* ? (Bombay. colln.)

Note.—Confirmation of the latter locality is desired before acceptance.

185. (394) **Oligodon taeniolatus** (Jerdon.) *The Variegated Kukri Snake.*

O. subgriseus. *Boulenger, Cat. Vol. II,* 1894, *p* 243; *Ferguson, Bomb. N. H. J. Vol. X, p* 71; *Millard, Bomb. N. H. J. Vol. XV, p* 348; *Pearless, Spol. Zeylan.* 1909, *p* 54; *Sarasin, Zool. Jahr. Jena.* 1910, *p* 130; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 25; *Wall, Bomb. N. H. J. Vol. XVI, p* 298; *l.c. Vol. XIX, p* 556; *l. c. Vol. XXVI, p* 568; *Spol. Zeylan.* 1921, *p* 406; *Willey, Spol. Zeylan.* 1906, *p* 233.

O. taeniolatus. *Wall, Oph. Tap.* 1921, *p* 239.

Length.—584 mm. (1 foot, 11 inches).

Lepid.—Subcaudals. 29 to 56.

Distn.—Ceylon. Peninsular India. To Sind, Baluchistan, and N. W. Frontier. In the North-East to Bengal. (Karagola, Purnea Dist. Ind. Mus.). *Western Himalayas.* Garhwal Dist. (Dhikala. Ind. Mus.)

Note.—Jerdon (J. A. S., Beng., Vol. XXII, 1853, p 529) describes a snake under the name *Coronella taeniolata* which is clearly this species. Costals 15, ventrals 185, subcaudals 41, which he says "is common at Madras," and he cites Plate XIX of Russell's first volume as the snake he alludes to.

186. (*Nil*) **Oligodon melaneus** Wall. *Wall's Kukri Snake.*

Wall, Bomb. N. H. J. Vol. XIX, p 349.

Type.—From Sukna, in the British Museum. Co-type in the Bombay Natural History Society's collection.

Length.—333 mm. (1 foot, 1⅛ inches).

Lepid.—Costals. 15 in the whole body length. Ventrals. 152 to 159. Anal. Divided or entire. Subcaudals. 40 to 42, divided.

Distn.—Eastern Himalayas. Sikkim. (Sukna.)

187. (389) **Oligodon brevicauda** Günther. *The Short-tailed Kukri Snake.*

Boulenger, Cat. Vol. II, 1894, *p* 240; *Ferguson, Bomb. N. H. J. Vol. X, p* 71; *Sarasin, Zool. Jahr. Jena.* 1910, *p* 138.

Distn.— Western Ghats. South of the Goa gap. Nilgiris. Anamalais. Travancore.

188. (378) **Oligodon violaceus** (Cantor.) *The Violaceus Kukri Snake.*

Simotes violaceus. *Boulenger, Cat. Vol. II,* 1894, *p* 222; *l. c. Vol. III,* 1896, *p* 640; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 23; *Wall and Evans, Bomb. N. H. J. Vol. XIII, pp* 350 *and* 618; *Wall, Bomb. N. H. J. Vol. XII, pp* 672 *and* 766; *l. c. Vol. XIX, p* 831.

Lepid.—Ventrals. 157 to 182 (196, Boulenger.) Subcaudals. 29 to 42.

Distn.—Eastern Himalayas. Eastern Bengal. Chittagong Hills. *Assam.* Nazira. (Ind. Mus). Baroi. Tinsukia. (F. W.) Khasi Hills. Naga Hills. *Burma.* As far North as Mansi. (Lat. 24·7°. Long. 95·7°.) Manipur. Arakan Hills. S. Shan States. (Taunggyi.) Tenasserim. *Siam.* Peninsula North of Kra. *Indo-China.* Camboja. *China.* Southern Provinces, and South Coastal Islands. *Lepid. Costals.* Rarely in 19 rows.

189. (382) **Oligodon theobaldi** (Günther.) *Theobald's Kukri Snake.*

Simotes beddomii. *Boulenger, Cat. Vol. II,* 1894, *p* 229; *Sarasi Zool. Jahr. Jena.* 1910, *p* 138; *Wall, Bomb. N. H. J. Vol. XXII p* 170.

Simotes theobaldi. *Boulenger, Cat. Vol. II,* 1894, *p* 230; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 24; *Wall and Evans, Bomb. N. H. J. Vol. XIII, pp* 350 *and* 618; *Wall, Bomb. N. H. J. Vol. XVIII, p* 783; *l. c. Vol. XXIII, p* 170.

Lepid.—Ventrals. 164 to 180; Subcaudals. 30 to 42.

Distn.—Assam. Garo Hills. (Tura. Bombay colln.) *Burma.* As far North as Myitkyina. (Bombay colln.) To Tenasserim. (Mergui. Ind. Mus.)

Note.—Wynad on the authority of Beddome (Types of *beddomei*) must be discredited for reasons cited in the note to *Natrix parallelus.* Karachi (No. 11712, Ind. Mus.) is also untrustworthy.

190. (380) **Oligodon arnensis** (Shaw.) *The Common Kukri Snake.*

Simotes arnensis. *Abercromby, Sn. of Ceylon,* 1910, *p* 72; *Boulenger. Cat. Vol. II,* 1894, *pp* 229 *and* 359; *Ferguson, Bomb. N. H. J. Vol. X, p* 71; *Sarasin, Zool. Jahr. Jena.* 1910, *p* 130; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 24; *Wall, Bomb. N. H. J. Vol. XVIII, p* 115; *l. c. Vol. XIX, p* 532; *l. c. Vol. XXII, p* 749; *Willey, Spol. Zeylan.* 1906, *p* 233.

Oligodon arnensis. *Wall, Spol. Zeylan.* 1921, *p* 400; *Oph. Tap.* 1921, *p* 231.

Length.—700 mm. (2 feet and $\frac{3}{8}$ of an inch).

Lepid.—Ventrals. 164 to 202.

Distn.—*Ceylon. Peninsular India.* To Dera Ghazi Khan. (Bombay colln.) *N. W. Frontier.* (Bannu. F. W.) *Western Himalayas.* Almora Dist. (F. W.) *Eastern Himalayas.* Nepal to Sikkim.

191. (383) **Oligodon cruentatus** (Günther.) *The Crimson-tailed Kukri Snake*

Simotes cruentatus. *Boulenger, Cat. Vol. II, p* 231; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 24; *Wall and Evans, Bomb. N. H. J. Vol. XIII, pp* 349 *and* 617.

Length.—387 mm. (1 foot, $3\frac{1}{4}$ inches).

Distn.—*Burma.* As far North as Bhamo, and South as Rangoon.

Note.—Stoliczka's record of a specimen from Penang I discredit.

192. (*Nil.*) **Oligodon erythrogaster** Boulenger. *The Red-bellied Kukri Snake.*

Simotes octolineatus. *Günther, P. Z. S.* 1861, *p* 216; *Rept. Brit. Ind.* 1864, *p.* 206.

Oligodon erythrorhachis. *Annandale, Rec. Ind. Mus.* 1912, *p* 48.

Oligodon erythrogaster. *Boulenger, Rec. Ind. Mus.* 1907, *p* 217; *Wall, Bomb. N. H. J. Vol. XIX, p* 1000. *l. c. Vol. XXII, p* 639.

Type.—From Nagarcoil, Nepal, in the Indian Museum.

Length.—510 mm. (1 foot, $8\frac{1}{16}$ inches).

Lepid.—Costals. In 17 rows to behind midbody, 15 or 13 two heads-lengths before the vent. Ventrals. 163 to 186. Anal. Divided. Subcaudals. 42 to 59, divided. Nasal. Entire. Loreal. Absent. Temporal. One (rarely two). Supralabials. 7, the 3rd and 4th touching the eye, 6th cuneate, not reaching edge of lip.

Distn.—*Eastern Himalayas.* Nepal to Sikkim (Tindharia. F. W.) *Assam.* Abor Hills.

Note.—I have now seen six specimens including the type.

193. (387) **Oligodon travancoricus** Beddome. *Beddome's Kukri Snake.*

Boulenger, Cat. Vol. II, 1894, *p* 236; *Ferguson, Bomb. N. H.J. Vol. X, p* 71; *Sarasin, Zool. Jahr. Jena.* 1910, *p* 138; *Wall, Bomb. N. H. J. Vol. XXIII, p* 169.

Lepid.—Ventrals. 145 to 155.

Distn.—*Western Ghats.* South of the Palghat gap. Travancore. (High Range.) Tinnevelly.

Note.—In 1914 (Bomb. N. H. J. Vol. XXIII, p 169) I questioned the validity of this species apart from *venustus.* My doubts were based on a study of external characters. Since then I have acquired one skull, a comparison of which with my seven skulls of *venustus* supports Boulenger's view. Maxillary. *Venustus* 7 to 8 (8 usually); *travancoricus.* 7. Palatine. *venustus* 0 to 3; *travancoricus* 0. Pterygoid. *venustus* 4 to 8 : *travancoricus* 12. Mandibular. *venustus* 9 to 11 : *travancoricus* 8

194. (386) **Oligodon venustus** Jerdon. *Jerdon's Kukri Snake.*

Boulenger, Cat. Vol. II. 1894, *p* 235; *Sarasin, Zool. Jahr. Jena.* 1910, *p* 138 ; *Wall, Bomb. N. H. J. Vol. XXIII, p* 169; *l. c. Vol. XXVI, p* 567.

Length.—495 mm. (1 foot, 7½ inches).

Lepid.—Ventrals. 138 to 165. Subcaudals. 27 to 36.

Distn.—*Western Ghats.* South of the Goa gap. Wynad. Nilgiris. Palnis. Cochin. Travancore.

195. (*Nil.*) **Oligodon melanozonatus** Wall.

O. erythrorhachis. *Annandale. Rec. Ind. Mus.* 1912, *p* 48.

O. melanozonatus. *Wall. Rec. Ind. Mus. Vol. XXIV, p* 29.

Type.—No 16799 in the Indian Museum from Upper Rotung Valley, Abor Hills, Assam Frontier. Co-type No 16798 Ind. Mus.

Length.—513 mm (1 foot, 8¼ inches).

Lepid.—Costals. Two heads-lengths behind the head 17, midbody 17, two heads-lengths before the vent 15. Ventrals. 171 to 173. Anal. Divided. Subcaudals. 42 to 45, divided. Loreal. Absent.

Distn.—*Assam.* Abor Hills beyond the Frontier.

196. (388) **Oligodon affinis** Günther. *Günther's Kukri Snake.*

O. affinis. *Boulenger, Cat. Vol. II,* 1894, *p* 236; *Ferguson, Bomb. N. H. J. Vol. X, p* 71; *Sarasin, Zool. Jahr. Jena.* 1910, *p* 138 ; *Wall, Bomb. N. H. J. Vol. XXVI, p* 568.

Lepid.—Subcaudals. 23 to 36.

Distn.—*Western Ghats.* South of Goa gap. Wynad to Travancore (High Range. Ferguson).

(381) Oligodon beddomei Boulenger.

Note.—See *Oligodon theobaldi.*

Oligodon octolineatus (Schneider.)

Note.—This I feel certain does not occur within Indian limits. Anamalais on the authority of Colonel Beddome is to be discredited. See note to *Natrix parallelus.*

197 (*Nil.*) **Oligodon woodmasoni** (Sclater.) *Wood-Mason's Kukri Snake.*

Simotes woodmasoni. *Annandale, J. A. S., Beng.,* 1905, *pp* 173 *and* 175 ; *Boulenger, Cat. Vol. II,* 1894, *p* 223 ; *Sclater, List Sn. Ind. Mus.* 1891, *p* 24.

Lepid.—Subcaudals. 46 to 57. Loreal. Absent on both sides in specimen No 8459, and absent on the right side in No 12547 of the Indian Museum.

Distn.—*Andamans. Nicobars.*

Note.—I have examined both the co-types in the Indian Museum. The 3rd labial is divided in both, and the upper part, and the 4th touch the eye. Ventrals. 180 in both. Subcaudals. 54 in No 12547 ; 48 (tail slightly incomplete) in No 8459.

198. (*Nil.*) **Oligodon juglandifer** (Wall.) *The Large-spotted Kukri Snake.*

Simotes albocinctus. (*part*) *Boulenger, Cat. Vol. II,* 1894, *p* 220 (*part Var. C.*).

Simotes juglandifer. *Wall, Bom. N. H. J. Vol. XX, p* 1162.

Type.—In the Bombay Natural History Society's collection. From Tindharia, Darjeeling District.

Length.—717 mm. (2 feet, 4¼ inches).

Lepid.—Costals. 19 in midbody. Ventrals. 162 to 208. Anal. Entire. Subcaudals. 53 to 68.

Distn.—Eastern Himalayas. Nepal to Sikkim. *Assam.* Khasi Hills. (Brit. Mus.).

199. (377) **Oligodon albocinctus** (Cantor.) *The Light-barred Kukri Snake.*

Simotes albocinctus. *Annandale, Rec. Ind. Mus.* 1912, *pp* 37, 48 *and* 53; *Boulenger, Cat. Vol. II,* 1894, *p* 220 (*part, Var. A. and B.*), *Rec. Ind. Mus.* 1913, *p* 338; *Evans, Bomb. N. H. J. Vol. XVI, p* 169; *Sclater, List Sn. Ind. Mus.* 1891, *p* 23; *Venning, Bomb. N. H. J. Vol. XX, p* 338; *Wall, Bomb. N. H. J. Vol. XIX, pp* 348, 757*a*, 830 *and* 898; *l. c. Vol. XXII, p* 756.

Length.—864 mm. (2 feet, 10 inches).

Lepid.—Ventrals. 177 to 208. Subcaudals. 47 to 69.

Distn.—Bengal. Rangpur District. (Kaligang. Ind. Mus.) Chittagong Hills. *Eastern Himalayas.* Buxa Dooars to Sikkim. *Assam.* Plains and Hills. *Burma.* As far North as Simla. (Lat. 25·2.° Long. 97°. Bombay colln.) Kachin Hills. Manipur. Chin Hills. Arakan Hills.

200. (376) **Oligodon purpurascens** (Schlegel.) *Schlegel's Kukri Snake.*

Simotes purpurascens. *Boulenger, Cat. Vol. II,* 1894. *p* 219.

Simotes cyclurus. *Boulenger, Cat. Vol. II,* 1894, *p* 219; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 22; *Wall and Evans, Bomb. N. H. J. Vol. XIII, pp* 350 *and* 617; *Wall, Bomb. N. H. J. Vol. XVIII, p* 780; *l. c. Vol. XIX, p* 348.

Length.—865 mm. (2 feet, 10 inches) (Malcolm-Smith).

Lepid.—Ventrals. 159 to 195 (156 to 210. Boulenger). Subcaudals. 40 to 60.

Distn.—Bengal. Purnea Dist. Rangpur Dist. Jalpaiguri Dist. Calcutta. (Ind. Mus.) *Eastern Himalayas. Assam.* Garo Hills. (Ind. Mus.) Khasi Hills (F. W.) *Burma.* Manipur. (F. W.) S. Shan States. (Taunggyi, Kalaw.) Plains South of Lat. 21°. Karen Hills. Diamond Island (Ind. Mus.). Tenasserim. *Malay Peninsula.* (Stoliczka). *Malay Archipelago.* Sumatra. (Flower.) *Siam and Coastal Islands. Indo-China. Cochin-China. China.* In the South. Hongkong (Specimen so labelled in City Hall. Museum. F. W.)

201. (375) **Oligodon splendidus** (Günther.) *The Ornate Kukri Snake.*

Simotes splendidus. *Boulenger, Cat. Vol. II,* 1894, *p* 217; *Evans, Bomb. H. N. J. Vol. XVI, p* 362; *Sarasin, Zool. Jahr. Jena.* 1910, *p* 142; *Venning, Bomb. N. H. J. Vol. XXIII, p* 164; *Wall and Evans, Bomb. N. H. J. Vol. XIII, p* 537; *Wall, Bomb. N. H .J. Vol. XVIII, p* 781; *Rec. Ind. Mus. Vol. II, p* 105.

Length.—730 mm. (2 feet, 4¾ inches).

Lepid.—Ventrals. 169 to 193. Subcaudals. 35 to 47.

Distn.—Burma. Between Lat. 20° and 23° and Long. 94° and 98°. Yamethin. (Wall and Evans.) Sagaing. (Evans.) Pyawbwe. (Venning.) Shwebo, Monywa, Mandalay. (Bom. colln.) N. Shan States. (Ruby Mines. Evans) S. Shan States. (Kyaukse and Pakokku. Ind. Mus.).

Note.—The locality of the type, presented by Beddome to the British Museum (Wynad) is to be discredited. All the other preserved specimens are from Burma. See note to *Natrix parallelus.*

Genus.—CONTIA *Baird and Girard.*

202. (*Nil*). **Contia persica** (Anderson). *Anderson's Contia.*

Cyclophis persicus. *Anderson, P. Z. S.* 1872, *p* 392. *Blanford, Zool. E. Persia.* 1876, *p* 408.

Pseudocyclophis persicus. *Boettger, Zool. Jahrb.* 1888. *III p* 922.

Contia persica. *Boulenger, Cat. Vol. II.* 1894, *p* 263. *Ingoldby, Bomb. N. H. J. Vol. XXIX, p* 129. *Wall, Bomb. N. H. J. Vol. XVIII, p* 801.

Contia angusticeps. *Annandale, Bom. N. H. J. Vol. XVIII, p* 801. *J. A. S. Bengal.* 1904, *p* 208. *Boulenger, Cat. Vol. II.* 1894, *p* 262. *Ingoldby, Bomb. N. H. J. Vol. XXIX, p* 129. *McMahon, Bomb. N. H. J. Vol. XIV, p* 181. *Wall, Bomb. N. H. J. Vol. XVIII, p* 501.

Contia walteri. *Bomb. N. H. J. Vol. XX, p* 1037.

Lepid.—Loreal. Sometimes absent. Costals. Two heads-lengths behind head 15, midbody 15, two heads-lengths before vent 15 or 13. Ventrals. 185 to 214. Subcaudals. 63 to 82.

Distn.—Persia. Baluchistan. Cherat. (No. 13680. Ind. Mus.) *N. W. Frontier.* Malakand. Parachinar (Bombay colln.) *Western Himalayas.* Murree. (Bombay colln.)

Note.—In an anomalous specimen from Malakand in the Bombay collection, the fourth costal row above the ventrals divides and blends several times so that the rows count 17 in places.

203. (360) **Contia walteri** (Boettger.) *Walter's Contia.*

Pseudocyclophis walteri. *Boulenger, Faun. Brit. Ind. Rept.* 1890, *p* 300

Contia walteri. *Boulenger, Cat. Vol. II,* 1894, *p* 263.

Distn.—Transcaspia. Sind. Kolustan.

Note.—I suspect the Sind specimen will prove to be *persicus.*

204. (*Nil.*) **Contia mcmahoni** Wall. *McMahon's Contia.*

Wall, Bomb. N. H. J. Vol. XX, p 1038.

Types.—In the Quetta Museum. From Baluchistan.

Length.—311 mm. (1 foot and ¼ of an inch.)

Lepid.—Costals. Two heads-lengths behind head 13, midbody 15, two heads-lengths before vent 13. Ventrals. 204 to 212. Anal. Divided. Subcaudals. 91 to 96.

Distn.—Baluchistan. Quetta. Mach. Loralai. Spintangi.

Note.—I have seen four specimens.

(*To be continued.*)

ANIMAL LIFE OF THE GANGES.

(A lecture delivered in the Indian Museum, Calcutta, on the afternoon of August 22nd, 1923.)

By N. Annandale, D. Sc., C.I.E.,

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The study of the animal life of the Ganges is no new thing. For many centuries it has attracted the attention of rulers, of religious leaders and of naturalists, who have regarded the matter from a practical, a superstitious or an intellectual point of view. Even in a strictly scientific sense it dawned in Bengal before the beginning of the 19th century. Apart from casual mention of a few real and mythical animals, the earliest document we possess is the Fifth Pillar Edict of Asoka[1] by which game laws and fishery legislation were instituted in northern India in the 3rd century B.C. In this inscription the Emperor Asoka had carved on enduring stone a list of birds, beasts, fishes and possibly even insects which were to be strictly preserved from slaughter, and he decreed that no fish of any kind should be caught or sold on fast days throughout the year or for three days at four full moons in each year.

Unfortunately the names of aquatic animals in his list of protected species are very obscure. To judge, however, from modern Bengali two names have preserved their meaning for all these centuries and are still in use in a modified form. They are those of the Sting-rays (of which two species are common in the Ganges)[2] and of a common river tortoise or terrapin now known to science as *Kachuga donghoka.*[3] Possibly Asoka also included the Gangetic Porpoise in his list, for the word *gangapuputakas*, which has puzzled the commentators, may be partly onomatopœic, representing the noise made by the animal as it expels its breath on the surface.

Asoka's motive was neither economic nor scientific. He was an ardent Buddhist reformer interested in animals as partaking of life and thus being in the stream of transmigration. We do not know why he considered certain species more important than others from this point of view: perhaps because their names were mentioned in ancient legends current in his time and already adopted into Buddhism. Perhaps, on the other hand, their flesh or some other product of them was regarded as a luxury and not as a necessity of life.

After about seventeen centuries another emperor appeared in Hindustan who was a real naturalist—Babur, the first of the Moghuls. Babur is one of the most human characters in Indian history, in which he lives as few others live because of the intimate personal memoirs he left behind him. These included not only an account of his own adventurous and momentous life but also a description of India and its natural products—the first Imperial Gazetteer. Amongst many practical and intellectual activities Babur, who was probably in a sense illiterate, was a keen botanist. The only two things he admired in India were the wealth of the country and the red Hibiscus flower, but he took an interest in its animals also. He was the first to describe a peculiar habit of the commonest of our north Indian frogs (*Rana cyanophlyctis*), which skips lightly along the surface of the water when disturbed.[1] He gave also a description of the Gangetic Porpoise, evidently from his own observation, and of the crocodiles of the river, all of which must have seemed strange and unnatural beasts to a man from central Asia. After Babur more than two centuries were to elapse before the animals of the Ganges were first studied in a scientific spirit.

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[1] For the latest translation of this edict see Vincent A. Smith, *Asoka* in the "Rulers of India" series, p. 204 (Oxford: 1920).

[2] Asoka's name, which is translated "(?) skate" by Smith, is *samkujamachi* a compound word in which the last two syllables of course mean fish. The equivalent for the first two syllables in Sanscrit and modern Bengali is *sankar*, which is said to mean 'bastard' or 'mongrel,' *i.e.*, between a fish and a tortoise. See Chaudhuri, *Journ. As. Soc. Bengal* VII, p. 627 (1912).

[3] Asoka called it *dadi* or *dudi* and the name is translated 'female tortoises' by Smith. The modern Bengali is *dundi, dudr* or *dhoor*. The flesh of this tortoise can be eaten even by Brahmins. See Chaudhuri, *Rec. Ind. Mus.* VII, p. 212 (1912), and Haraprasad Shastri, *Journ. As. Soc. Bengal* X, p. 137 (1914).

The initiation of this new work was due to a Scotchman, but he was by no means the first European naturalist who wrote on the fauna of the river. To the Greeks and the Romans[2] India was a land of marvels. Herodotus, the Father of History, remarked in his sober way some twenty three centuries ago, how strange it was that the uttermost parts of the earth produced the most admirable products. He gave as an instance the supposed fact that the animals of India, except the horse, were larger than those found elsewhere.[3] Later writers greatly improved on this. They talked of eels 300 feet in length, of the monstrous turtles of the Ganges and of a sky-blue worm 60 cubits long and armed with a pair of tusks (or gills) by means of which it seized the elephants which came to drink at the river's edge. The elder Pliny, who lived in the 1st century A. D. quoted this story of the elephant-eating worm with some reserve, but also gave an account, only exaggerated in point of size, of the Gangetic Porpoise, which he called by the modern generic name *Platanista.* Further, he recorded the fact that certain fish of the Ganges migrate overland to breed in isolated pools. To this point I will return later. After Pliny the next writer of importance on the Gangetic animals was Aelian, who wrote in Greek about a century later. He added little, except a fairly accurate description of the Gharial. Neither Pliny nor Aelian had visited India : they relied on travellers' tales. We need not follow out the history of the myths they transmitted, but may note in passing that for once Sir John Maundeville, the notorious liar of the Middle Ages, was more moderate and reduced the length of the Indian eels from 300 feet to " 30 foote or more."

To come to modern zoology, Dr. Francis Buchanan, the Scotchman to whom I have already referred, came to India in 1794 as an assistant surgeon and was stationed in this capacity for some years in the Sunderbans. There, influenced probably by the great French naturalists of his time, he spent his leisure in studying the fish of the deltaic creeks and estuaries. Later he was appointed to conduct a statistical survey of certain parts of Bengal and in the course of his work continued and extended these investigations and prepared an elaborate account of the fisheries, which was published many years later by Hunter in his *Statistical Account of Bengal.*[4] In 1822 after leaving India he published in Edinburgh his " Fishes of the Ganges," which is still an indispensable work of reference. Many of the original drawings of Gangetic fish prepared under his supervision are still preserved in the Asiatic Society's library in Calcutta; if published they would settle many disputed points.

After the time of Buchanan (who later assumed the name of Hamilton) a succession of zoologists worked on the Gangetic fauna in Calcutta. I have time only to mention the names of a few who are no longer living :—Benson, McClelland, Blyth, Theobald, Stoliczka, Anderson and Wood Mason.[1] Of these men the first was a judge, one was a doctor, two were geologists and only three were professional naturalists. Where are the successors of the brilliant amateurs ? The work was continued by Lt.-Col. A.W. Alcock, formerly Superintendent of the Indian Museum and now Professor of Entomology in the London School of Tropical Medicine, and is still being continued by the members of the Zoological Survey of India. On recent work we cannot linger, for we must now turn from literature to facts.

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[1] See Mrs. Beveridge's edition of the *Memoirs of the Emperor Babur,* fasc. p. 503 (1918); also Annandale, *Rec. Ind. Mus.* XVI, p. 122 (1919).

[2] See M Crindle's *Ancient India* (London: 1901) for which I am indebted for the references to Pliny and Aelian.

[3] A few very large animals are found in India and might give the impression of a gigantic fauna, but those species which have a very wide range are usually larger in temperate regions than they are in the tropics.

[4] The MS is in the possession of the Asiatic Society of Bengal and would repay re-editing.

From the faunistic point of view the Ganges system is divided into three parts, but the divisions are not quite the same as in the vegetation. Firstly we must distinguish the little streamlets which rush down the southern slopes of the Himalayas and unite in the valleys to form the larger tributaries; secondly we have the middle reaches, in which the Ganges and its great tributaries the Jumna and the Sone roll slowly across the great plain of northern India, and finally there are the deltaic tracts, where the main stream breaks up into innumerable tidal creeks and estuaries. Each of these regions has its own type of animal life.

In the tiny mountain streamlets there is an assemblage of very curious little animals, few if any of which could be mistaken for those from any other habitat. This is an interesting fact, for the animals of mountain torrents in Europe or North America or Japan, or even in the extreme western parts of the Himalayas, are few and very ordinary in appearance. Some of the insect larvæ are exceptionally flat and broad, or even are provided with special organs of adhesion but among the higher groups, in so far as they occur at all, there is rarely any, characteristic species. It is only as we approach the tropics, though temperature can have little to do with the matter in the cool Himalayan waters, that we find the fish and tadpoles of the little hill streams assuming peculiar forms and developing apparatus that will enable them to overcome the sudden floods and rapid rush of water to which they are exposed. So far as the fish are concerned, we find equally remarkable, but of course quite different, forms in the mountain torrents of South America,[2] but in Asia it is chiefly in the great tract of mountainous country which extends from the eastern Himalayas eastwards across China, and southwards through Burma and the Malay Peninsula into the Malay Archipelago that the young of the frog and toads seem to have conspired with the fish, to put the matter metaphorically, to produce special organs or modifications of existing organs that will enable them to cling tight in the cascades and eddies of the smallest streamlets.

Three principles are as a rule involved in their modifications, the principle of the sucker, that of producing friction in the right place and the right direction and that of reducing friction where it is undesirable. The last of these principles is illustrated mainly in the general outline of the fish and tadpoles. Almost any species from the hill-torrents of the lower eastern Himalayas will be found on examination to have very little depth, to be flat below and to have a peculiar outline in its upper profile, which rises in a gentle curve from the tip of the snout to about the middle of the body and after this point is nearly horizontal. An outline of this kind enables the animal to overcome, to a very large extent, the flow of water directed against its snout, so long as it keeps its head pointing upstream. The outline of the front part of its body offers little resistence in this position to the flow of the current, and the friction between the water and the animal is greatly reduced. Friction is also reduced in some species by the reduction or loss of scales.

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[1] For further particulars see the *Centenary Review of the Asiatic Society of Bengal* (1885),and Dr. Gravely's address on the history of Indian zoology in the Proceedings of the Eighth Indian Science Congress (*Proc. A. S. B.* 1922, p. cxxxii); for more recent work my lecture " On Some Recent Advances in our Knowledge of the Freshwater Fauna of India " in *Journ. As. Soc. Bengal* (n. s.) VIII, p. 39 (1912) and reports on the Zoological Survey of India for the years 1917 to 1920 and 1920 to 1923. A bibliography of the freshwater and brackish-water fauna of India (1912-1922) by C. Dover will be published shortly in the *Journ. As. Soc. Bengal.*

[2] See Regan on the Loricariidae, *Trans. Zool. Soc.* XVII, p. 191 (1904).

Devices for the production of friction are situated on the lower surface of the animal. Their structure is often highly complicated and they are found in the fish both on the body and on the paired fins, which are expanded fan-wise in a horizontal direction, while in both fish and tadpoles they seem to be concentrated as a rule in the neighbourhood of the mouth. Dr. Sunder Lal Hora[1] of the Zoological Survey of India has recently shown that many of the structures hitherto believed to be of the nature of suckers are really friction devices. These may have the form of series of parallel plates or lamellæ studded with minute spines, or they may consist of small papillæ or ridges, but the spines, which are often quite microscopic, are always present.

The friction apparatus always works in correlation with the outline of the animal, for the water passing over its flat head presses the head down and keeps it in position, and thus enables the spines, etc., to gain a firmer grip. I must refer those who wish for further information to Dr. Hora's papers in the *Records of the Indian Museum.*[2]

We must now consider briefly the development of suckers on some of the animals of the mountain-torrents in the upper reaches of the Ganges system.

The sucker to which I refer has no resemblance to the suckers of the roots of swamp-plants. It is a device for producing a vacuum or a greatly lowered pressure of air or water on the lower side of an object and thus increasing the relative pressure on its upper side. Its usual form is that of a membrane enclosing a very small cavity which can be suddenly and greatly increased in volume without the admission of any additional air or water. Probably all the flat-bellied forms which live in mountain torrents can to some extent transform themselves into suckers by raising the central part of their lower surface while maintaining the edge in close contact with the bed or sides of the stream, but in some few forms a special organ is produced for the purpose. Such organs are found in some of the insect larvæ of rapid-running water both in the Himalayas and in other parts of the world, but it is the fish and tadpoles of the eastern Himalayas that they have perhaps received the most detailed study[3]. They are especially conspicuous in the fish of the genus *Garra* or *Discognathus* and in the larvæ of the so-called *Ranæ formosæ*. In both of these the sucker lies on the ventral surface just behind the mouth and consists of a large circular disk surrounded by a rim and by variously arranged papillæ. It is brought into action by the raising of the floor of the disk independently of the rim, which remains in close contact with the rock or stone on which the animal is lying. A cavity, which is probably very nearly a vacuum, is thus brought into existence beneath the animal, while the whole pressure of the column of water under which it is lying and of the atmosphere above is exerted on its upper surface and holds it tightly in position.

These animals of mountain streams have many other interesting features in their anatomy and physiology, but it will be impossible to discuss them further here. I would rather invite your attention to the very close resemblance between the suckers of the fish and those of the tadpoles. In the fish we find some species with the suckers much better developed than others. We have, indeed, an almost perfect gradation from species in which there is merely a flattened area behind the mouth to those in which the organ is highly developed. We are dealing, therefore, with an evolutionary series, not with the sudden appearance of a new organ. The resemblance between the suckers in the two sets of animals is an excellent example of what is called parallel evolution or convergence. It cannot in the nature of things have come about owing to the common ancestry of animals so different as fish and tadpoles, but must have been evolved in direct or indirect correlation with the peculiar surroundings of the animals, either in response to some stimulus produced by the environment or by the selection of peculiarities that appeared in certain individuals by what we call chance, and were perpetuated. To me the former explanation, in so far as it is an explanation at all, seems much the more probable of the two, but it does not wholly exclude the other. It involves to some extent what is called the inheritance of acquired characters. To believe in the transmission of acquired characters was until recently heterodox, but within the last few years a strong reaction has taken place towards its acceptance—a reaction justified in my opinion by many remarkable facts well known to, but not always appreciated by naturalists. The original stimulus need not necessarily have produced a beneficial result, but if the result had not been beneficial, or at any rate harmless, the race would probably have perished.

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[1] See Hora, *Nature* CXI, p. 668 (1923).

[2] Hora, *Rec. Ind. Mus.* XIX, p. 195, XXII, pp. 13, 165, XXIV, p. 31: also a paper now in the press on observations made in the Khasi Hills.

[3] Annandale and Hora, *Rec. Ind. Mus.* XXIV, p. 506 (1922).

We must now consider the animals of the middle reaches of the river, but before doing so I would point out that there is a transition between the two faunas, as is nearly always the case in nature, which does not, as the old saying goes, move by leaps. In the larger streams (comparable to the trout-streams and even the salmon-rivers of Great Britain) which occupy the deeper valleys among the mountains even at considerable altitudes, we find certain of the torren-haunting forms. We also find an invasion of species from the plains and finally among the fish at any rate, there are a few conspicuous animals which make such streams their proper home. I will only mention two, the Mahseer and the Goonch. The Mahseer, which is an assembly of allied species rather than a single form, is known to all Indian sportsmen as the chief of Indian sporting fish. It is merely a gigantic migratory Barbel sufficiently muscular to make its way upstream against the strong currents of the rivers among and at the base of the hills. The Goonch, though like the Mahseer the giant of its tribe, is in many respects the Mahseer's antithesis. It is a huge sluggish catfish which skulks in crevices amongst the rocks and thus protects itself from the force of the current. Its enormous mouth enables it to gulp down almost any prey that approaches its retreat, while the long and sensitive tentacles which surround its mouth keep it in contact with all that moves around.

Generally speaking the river-life of the plains is much less remarkable than that of the hills. Pliny's gigantic eels and his elephant-catching worms have departed into the limbo of imaginary beings. We find, however, that the animals are as a rule larger than those of the hill torrents, in which there is no room for bulky organisms. They are also more sluggish and few are very highly modified in structure. They are, in fact, very much like the animals of any other slow-flowing river. Pliny, however, was perfectly right in saying that certain of the fish were capable of migrating overland. In a tropical country in which a heavy rainfall alternates with a definite dry season. animals which live in water are subjected to very special dangers and among the fish of all countries in which such conditions occur we find a number of species that have developed special means of living out of water for considerable periods. Fish of the kind are known to all of us in India, but I do not think that most of us realize the elaborate nature of the structures which enable them to live high and dry without dying. The main difference between the breathing of an air-breathing animal and the breathing (if we may call it so) of a true aquatic animal is that the latter obtains the oxygen necessary for its existence from water, while we obtain it from air. We are drowned in water because our lungs cannot extract oxygen from it, and similarly a fish is drowned in air because its gills cannot extract oxygen from air. Fish which are liable to partial desiccation must either have some special apparatus for storing water containing oxygen or else must learn how to breathe air. Both methods are adopted by different Gangetic fish[1].

The simplest modification is found in the murrels or snake-heads (*Ophiocephalus*), in which there is at the back of the neck a pair of large cavities lined with membrane containing many blood vessels. A considerable quantity of water can be stored in these cavities and the oxygen is extracted from it and makes its way into the blood through the thin walls of the vessels. In other fish such as the Koi (*Anabas scandens*) the membrane in the region of the gills is greatly elaborated and much folded as well as being full of blood vessels, so that there is a much greater surface through which oxygen can be extracted from the water. These structures are situated in cavities behind the head; in the Koi the membrane is supported by a bony labyrinth on which it is spread out in a thin film. In some of the catfishes and eels again, notably in the Singhi (*Saccobranchus fossilis*), a pair of sack-like organs have appeared which have practically the functions of lungs, that is to say are capable of extracting oxygen from air instead of water. Such fishes also have gills by which they get oxygen from water and they are, therefore, said to be amphipnoöus or breathing in both ways.

Comparatively few of the animals of the middle reaches of the Ganges, as I have already pointed out, are of peculiar types, but there are of course numerous very interesting and peculiar forms among them—crocodiles and turtles, fish of many kinds and sizes, water-snails and freshwater mussels, crabs and prawns, sponges and many others; but of these I can say little in the time at my disposal. I would rather draw your attention to phenomena of special interest and to animals that illustrate such phenomena. There is one feature very characteristic of the Gangetic fauna, namely the presence in it of a distinct marine element.[2] Zoologists and geologists alike believe that life originated in the sea, or at any rate that all the visible forms of life known to us are descended from marine organisms. At a very early period in geological history, however, certain forms migrated inland and, having once established themselves in rivers and lakes, often found it unnecessary, again speaking metaphorically, to undergo any great change in the course of ages. For this reason you will find that many kinds of freshwater animals are very similar all over the world, or at any rate over a very large part of it. A large number of the water-snails of Calcutta, for instance, have very close relatives among those of the British Isles, while in the valley of Kashmir many are actually identical with British species. The ancestors of all such forms came from the sea millions of years ago and their relatives which did not migrate inland have long since perished and disappeared. Strictly speaking, all freshwater animals are, therefore, of marine origin, but the marine element in the Gangetic fauna to which I have referred is something different. Its members are so closely related to animals which still live in the sea that we need have no doubt in claiming that their ancestors came from the sea at a not very distant geological date. To the most conspicuous member of the little group of marine animals which live in the Ganges above tidal influence I have already referred more than once. It is one of the most conspicuous animals of the river and was possible mentioned by Asoka in the 3rd century B.C. and certainly described by Pliny in the 1st century A.D., by Alberuni in the eleventh century and by Babur some five hundred years later. It is the Gangetic Porpoise now known to science as *Platanista gangetica.*

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[1]. Good figures will be found in the volume on the fishes in the Cambridge Natural History.

[2]. For an account of this element and of the brackish water fauna see Annandale, *Bijd. t. d. Dierkunde Nat. Atr. Mag.* (Max Weber Complimentary Volume), p. 143 (1922).

The terms porpoise, dolphin and whale have no very precise scientific meaning. Porpoises, dolphins and whales are all members of the group Cetacea, in which there are many species and genera which it would be difficult to place without doubt in any one of the three categories. Generally speaking porpoises and dolphins are much smaller animals than whales, and frequently the name porpoise is given to forms with a short rounded head while the so-called dolphins have a long and slender snout. The Gangetic Porpoise is small for a Cetacean (not more than 12 feet in length), but has an even longer and narrower snout than the true Dolphin. I will return to its physical peculiarities in a moment, but the most interesting fact about its life is that it lives in both the Indus and the Ganges and never goes to sea. The vast majority of the Cetacea are marine animals. A few, such as *Orcaella brevirostris,* which makes its way up the Irrawaddy for nine hundred miles and is also found in the lower regions of the Ganges, can live in both salt and fresh water, while a very small number of species have established themselves like *Platanista* inland in rivers or lakes. Such species are found outside India only in the great rivers and lakes of China and of South America. They are all more or less closely related to *Platanista* to which a species from the Tongting Lake in the centre of China has recently been shown to be very closely allied[1]. No similar species are known from the sea at the present day but the remains of allied forms occur in the marine tertiary deposits of different parts of the world. The Gangetic Porpoise is, therefore, a relic of a former age which has maintained its existence by forsaking the sea, where its race was about to perish for some unknown reason. Its relatives in China and South America have had a similar fate. The fact that this animal is found both in the Indus and the Ganges points to some former connection between the two rivers at a period when their physiography was very different from what it is now; but this connection may have existed, and in my opinion probably did exist, before the birth of either the Ganges or the Indus as a great river. Not improbably the genus first appeared in great lagoons or gulfs in what is now the Gangetic trough at a period when the present relations between land and sea had not yet been established in northern India.

In spite of its ancient ancestry *Platanista* is highly modified in certain respects, particularly in its long sensitive snout and in being practically blind. In these respects it is modified for life in very muddy water and is adapted to obtain its food, which consists of prawns, molluscs, etc., from the soft mud at the bottom of a sluggish river.

The Gangetic Porpoise is not the only animal of comparatively recent marine origin found in the Ganges above the influence of the tides, for at least two remarkable genera of bivalve molluscs share this peculiarity with it. They belong to the two families of the arc-shells and the razor-shells. The former are so called from a somewhat fanciful resemblance between the shells and Noah's Ark while the latter have their name from their long band-shaped outline and the sharp edges of the shells. In most parts of the world the animals of both families are exclusively marine, but in the rivers which run into the Bay of Bengal, and also in those which enter the Gulf of Siam, members of the two genera, which are called *Scaphula* and *Novaculina*[2] have made themselves at home in fresh water The shells of both genera are much smaller than those of most of their marine relatives and their structure is comparatively simple. Neither genus has any very close relations now living in the sea and we know nothing about their fossil ancestors. The fact, however, that the animals are simple in structure as compared with all the marine members of their respective families shows that they are probably very ancient and that they, like *Platanists*, left the sea as their race was dying. They were enabled to do so by their peculiar physiological adaptability, for they survived the change from salt water to fresh—a change which implies both a difference in the specific gravity and also in the chemical composition of the medium in which the animals lived. It is as though a man were to accustom himself to live permanently in tobacco-smoke instead of air.

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[1] See Hinton & Pycraft on *Liphotes, Ann. Mag. Nat. Hist.* (9) X, p. 232 (1922).

[1] Ekendranath Ghosh, *Proc. Zool. Soc. London* II, p. 1139 (1922).

[2] *Idem, Rec. Ind. Mus.* XIX, p. 64 (1920).

This physiological adaptability[1] is one of the most peculiar features of the animals which live in the creeks and estuaries of the Gangetic delta. To these animals we must now turn, leaving almost everything unsaid about the fauna of the middle reaches of the river. With them as with the fauna of the hill-streams the transition is gradual. We find many species which can live with equal comfort in the middle reaches and in the deltaic tracts; we find some that are characteristic of the upper waters of the delta, a few migrate periodically either from the sea or from the creeks for a considerable distance upstream, while a still smaller company takes the opposite course, descending from the middle reaches to the lower at the breeding season. Most noteworthy of those forms which come up the river from the sea is the Hilsa, one of our best known food-fishes. Like the salmon of Europe and North America it is a marine fish which ascends rivers to breed. Certain prawns also come up into the delta for the same purpose, while others go downstream into the sea from the lower reaches of the river. Animals which go upstream to breed are called anadromous, those which go downstream catadromous.

The great majority of the animals of the deltaic creeks and estuaries are, however, what is called euryhaline. That is to say they are (within certain limits) indifferent to the amount of salt dissolved in the water in which they live. Most of them are of marine origin and comparatively few can endure pure fresh water for any length of time. This feature is well illustrated by a little jellyfish called *Campanulina ceylonensis*[2], which was originally described from the sea off Ceylon but has also been found in brackish water in both India and Siam. When the water in the Belgatchia canal on the outskirts of Calcutta sinks very low, as it does as a rule at some date in April every year, lock-gates are opened which admit the brackish water of the Matlah river. With the water come swarms of this little jellyfish, and they lay their eggs in the canal. From the egg arises a simple larval form called a planula and this turns into a minute hydroid, which is fixed to bricks and mooring-posts. The hydroid again gives rise to a second brood of jellyfish by means of budding and the alternate generations of medusa and hydroid are rapidly perpetuated for some months, until the water is thick with litte medusæ and the submerged bricks of every ghat and the surface of every post are covered with the hydroid. Then come the rains and the water grows gradually fresh. When its specific gravity falls below a certain point both jellyfish and hydroid are killed and the species disappears from the canal, until it is re-admitted with the inflowing water in the following April.

These facts illustrate the manner in which the animals of the estuaries are attempting to establish themselves inland. I may give another and even more striking instance, that of the little crab *Varuna litterata*[5]. This animal is still more tolerant of changes in salinity than the jellyfish and its hydroid, for it can live equally well in the open sea and in pure fresh water, but its real home is in the estuaries. Every year a double invasion of the Varuna crab takes place in the neighbourhood of Calcutta. The crab breeds a little before the beginning of the rains. For some time the female carries her eggs tucked up under her tail, but the eggs, unlike those of the true river crabs, give rise to a little larva different from its parents, though not so different as the caterpillar is from the butterfly. The larvæ are produced in countless millions at the edge of the Hughli below Calcutta and in every creek of the Sunderbans. Their natural instinct leads them upstream: they swarm into every ditch of fresh or brackish water to which they can gain access, and not infrequently they block up pipes carrying water from the river.

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[1] Redeke's recent attempt to provide a more exact classification of brackish-water animals hardly applies to those of Indian waters, where conditions are much more complicated than in Europe. See Redeke, *Bigid. t. d. Dierkunde Nat. art. Mag.* (Weber complimentary volume), p. 329 (1922.)

[2] See Lloyd & Annandale, *Rec. Ind. Mus.* XII, p. 49 (1916), and Annandale *Mem. As. Soc. Bengal* VI, p. 112 (1919).

[3] See Kemp, *Mem. Ind. Mus.* V, p. 233 (1915).

As soon as the parent crabs have got rid of their family, to which as a matter of fact they pay no regard whatsoever, they too proceed to migrate inland. They crawl and swim into ditches and water-courses; they proceed along the gutters of the streets of Calcutta and, leaving the water, walk amongst the damp herbage of gardens and jungles and so penetrate into isolated ponds and tanks. They frequently appear in the tank in the Museum compound and I have seen one surrounded by a flock of crows in the middle of the lawn of the United Service Club.

And yet, in spite of this double migration inland, in spite of its tolerance of fresh water, the Varuna crab never establishes itself as a permanent denizen of inland waters in the Gangetic delta. From the Calcutta tanks it disappears rapidly and can as a rule be found only in a few of the ponds in the immediate neighbourhood of brackish water, in places such as Chingrihatta. Why is this ? Apparently because it cannot compete with the true river crabs which are already established in fresh water. It has appeared too late on the scene.

A little lower down in the delta a remarkable phenomenon has been observed by Dr. S. W. Kemp[1]. He found in the Matlah river, which is now mere creek connecting the remains of the once extensive Salt Lakes on the outskirts of Calcutta with the sea, that the fish and prawns and also some of the other animals were curiously similar in general appearance to those which he had seen dredged from great depths in the sea. Deep-sea animals have many peculiarities, the most conspicuous of which are their colouration, the condition of their eyes and the production of long thread-like organs of touch. In all these respects a large number of the Matlah forms show a strange resemblance to deep-sea species. Like these they are mostly either of a dull translucent white colour, like the glass of which lamp-shades are made, or when bright pigment is present in them it is usually of a deep pink or red shade, which is also common in the abyssal fauna. Most deep-sea fishes either have very large eyes to enable them to make use of any rays of light that may be present at great depths, or else have their eyes much reduced ; sometimes they are totally blind. Most of the fish of the Matlah river have very small eyes. Further, both they and certain of the prawns that live with them are provided with very long and slender organs of touch. In the fish (for example the well-known Topsi or mangoe fish) it is the rays of the anterior paired fins which are produced into long filaments. In at least one kind of prawn common in the Gangetic delta, however, the legs have lost their function as organs of progression and have become tremendously long threads which trail round the animal as it swims by means of the little paddle-like organs beneath its tail. Just so certain deep-sea prawns have produced thin thread-like legs, but it is interesting to observe that in the abyssal forms the lengthening of the leg has taken place in quite a different way from that in which it has been brought about in the estuarine species and that different parts of limbs are modified in the two forms.

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[1] Kemp, *Rec. Ind. Mus.* XIII, p. 233 (1917).

This resemblance between a number of the animals of a small comparatively shallow deltaic creek and those of the deeper parts of all seas is a striking phenomenon which cannot be gainsaid by any observer who has seen the animals in their fresh state; but what does it mean? Most of the forms from the creek differ greatly in their general structure from deep-sea forms[1] Why should unrelated animals from such different habitats resemble one another outwardly; too many different kinds of animals are involved for us to call in mere chance as an explanation. We cannot of course say what is the ultimate cause of this convergence, but there are only two physical features which the deep sea and the creeks of the Gangetic delta have in common, *viz.*, a very soft oozy bottom and a low visibility, due in one case to absorption of the rays of light as they penetrate through thick layers of water and in the other to the fact that the water is full of minute particles of suspended silt which produce in it much the same effect as fog or smoke does in the air. We can hardly doubt that the resemblance between the two faunas is in some way associated with this resemblance in the physical characters of their environment. Here again we have an example of parallel evolution, but of a different kind, for here the convergent forms do not live together but in very different surroundings, which have only certain factors in common. Evolution has been at work on parallel or rather convergent lines and some response to environment on the part of ancestral forms is plainly indicated.

I must now bring my lecture to a close. I have not attempted the impossible task of summarizing the multitudinous aspects of the Gangetic fauna in the space of an hour. What I have tried rather to do is to bring to your notice a few of these aspects, and particularly to say something of the wonderful manner in which some of the animals are modified to suit their surroundings in different parts of the river-system. Another point of special interest on which I have laid stress is the fact that animals to be successful in the race of life cannot trust merely to the modifications that come about in their bodies without their own volition. With the Varuna Crab and the Ceylon Medusa individual effort is necessary to conquer new territories, and even if the conquest is not permanent a slight change in conditions may make it permanent some day, if only the effort be persistent from generation to generation. As it is with these little water beasts, so it is also with mankind. Success depends on effort.

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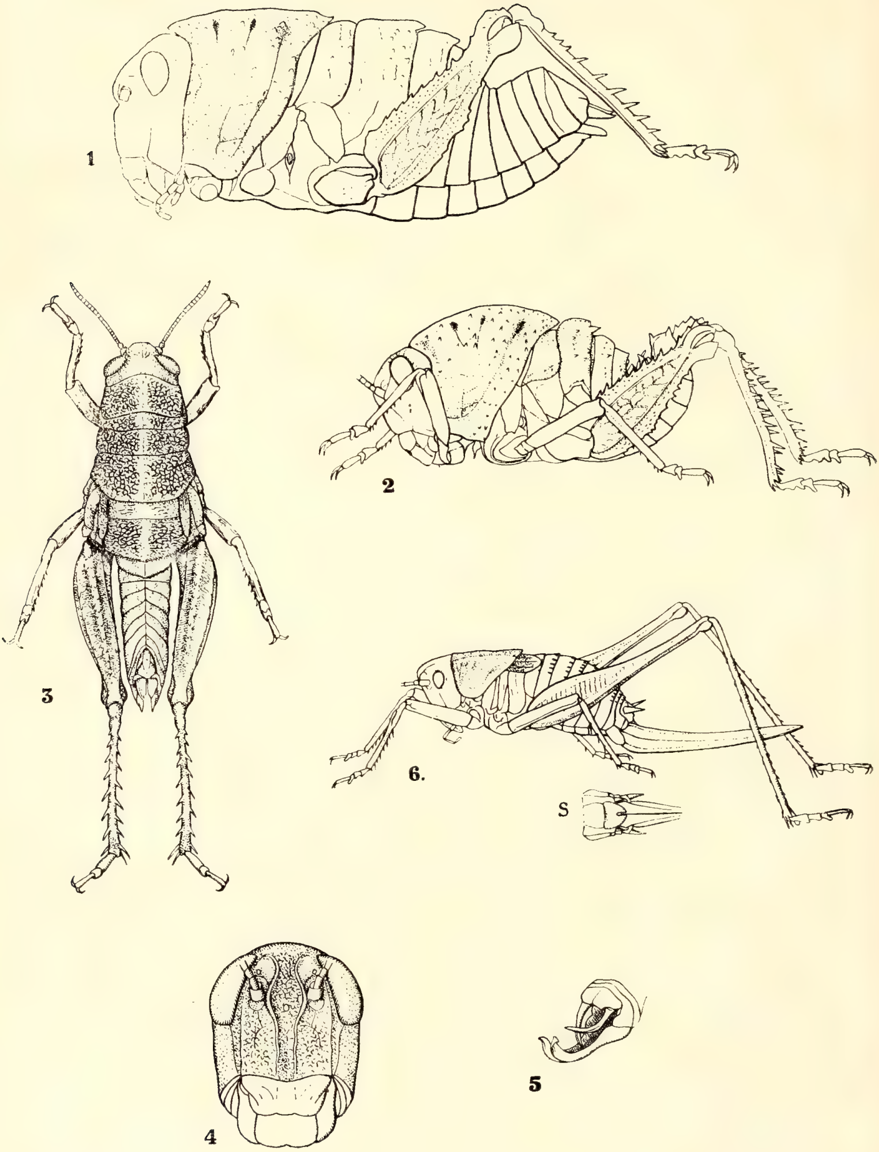
[1] The only exception is the "Bombay Duck (*Harpodon nehereus*) which is loosely related to deep-sea forms but is itself at home in estuaries.

Plate I.



New Orthoptera from Persia and India,

SOME NEW OR INTERESTING ORTHOPTERA FROM PERSIA, BALUCHISTAN AND WESTERN INDIA

By

B. P. UVAROV, F.E.S.

(*with a Plate.*)

The present paper is based mainly on an interesting collection of Orthoptera sent to me by the Bombay Natural History Society for identification. The results obtained in working out the collection corroborated once again my statement* that the fauna of Orthoptera of the Asiatic deserts is most inadequately known and includes many undescribed and very striking forms. I earnestly hope that my papers in this Journal* will draw attention of entomologists who have the opportunity of collecting in the Punjab, Sind, Baluchistan, Afghanistan, Mesopotamia and Persia to this badly neglected group of insects ; there is no doubt that even most casually made collections will bring something new, or, at least, throw some light on the distribution of known species.

The types of new species described in this paper have been presented by the Society to the British Museum, through the Imperial Bureau of Entomology.

MANTIDÆ.

1. *Eremiaphila laevivrons* Uv.

Baluchistan: Hazarganji 40 miles S. E. of Khozdar, 19, ix, 1917, 1 ♀ (J.E.B. Hotson). The species has been quite recently described by me from Muscat, Arabia (Journal Bombay Natural History Society, xxviii, 1922, p. 351), and the specimen from Baluchistan is exactly alike the type.

ACRIDIDÆ.

2. *Acantholobus curticornis* Hanc.

India : Deolali, Oct., 1915, 1 ♀ (N. B. Kinnear).

This species has been described by Hancock (Rec. Ind. Mus., xi, 1915, p. 92), from Satara district, Bombay Presidency, and not recorded since. The specimen before me agrees in all details with the original description.

3. *Chloebora crassa* (Walk.)

India : Nasik, 1,900 ft., Sept., 1914, 1 ♂, 2 ♀ ♀ (N. B. Kinnear).

This is the first exact record of this species since Walker described it from "N. Bengal" without giving more precise locality.

The genus *Chloebora* seems to me hardly separable from *Humbe*, but I cannot express a definite opinion on the matter, as I know only one species of *Chloebora* which is not even the genotype.

4. *Oedipoda miniata* (Pall. *nec. auct*).

1771. *Gryllus miniatus*, Pallas, Reise durch versch. Prov. *etc.*, p. 467.
1839. *Oedipoda gratiosa*, Serville, Ins. Orth., p. 727.
1923. *Oedipoda miniata*, Uvarov, Novitates Zoologicae, Vol. xxx, p. 70.

Persia : Shiraz, 14, viii, 1920, 1 ♀ (J. E. B. Hotson).

I have shown in the paper, quoted above, that the name *miniata* Pall. has been quite incorrectly applied to another species of the genus, *O. germancia*, Lat.

5. *Oedipoda schochi* Sauss.

S. Persia : Akbarabad, 5, x, 1919, 1 ♀ (J. E. B. Hotson).

The specimen has got the hind wings with a distinct violet tinge ; their band almost reaches the inner margin; the head and pronotum are strongly rugose, the latter with very sharp, though irregular, lateral carinae and the hind margin of lateral lobes distinctly festooned. Its dimensions are, as follows :—length of body 23, pronotum 7, elytra 23, hind femur 15 mm. On the whole, it is a comparatively slender insect, scarcely more robustly built, than *O. miniata* and therefore it cannot be identified with the typical Syrian form of the species which is, according to Saussure's description a larger and more heavily built insect. Our specimen seems to come nearer sub-species *caucasica*, Sauss. but hardly identical with it. A series of four specimens of *O. schochi* in the British Museum from Kazvin, N. W. Persia, seem to agree fairly well with the original description of the Syrian form. On the other hand, one female in the same Museum, from the Lar valley, S. Persia is small, but heavily built, with rugosities on the head and pronotum sub-obliterate, wings pale bluish and their fascia broad, almost reaching the inner margin. It is impossible yet to use these scanty materials for a study of geographical variations of the species, but I wanted to draw attention of systematists to the necessity of such a study.

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* See this Journal, xxviii, pp. 71, 351 and especially p. 1149.

6. *Sphingonotus obscuratus* (Walk.).

1870. *Oedipoda obscurata*, Walker, Zoologist, xxviii, p. 2300.
1884. *Sphingonotus brunneri*, Saussure, Prodr. Oed., pp. 197, 206.
1888. *Sphingonotus brunneri*, Saussure, Addit. ad Prodr. Oed., p. 87.
1898. *Sphingonotus brunneri*, Zubowsky, Ann. Mus. Zool. Acad. Imp. Sc. St. Petersb., iii, p. 97.
1902. *Sphingonotus lameerei*, Finot, Aun. Soc. Ent. Belg., xlvi, p. 434.
1905. *Sphingonotus brunneri*, Jacobson and Bianchi, Priamokr Lozhnos Ross. Imp., p. 276.
1911. *Sphingonotus brunneri*, Ikonnikov, Revue Russe d'Entom., xi, p. 358.
1913. *Sphingonotus lameerei*, Rehn, Bull. Soc. Ent. Egypte, iii, p. 46.
1913. *Sphingonotus brunneri*, Bolivar, Novit, Zool., xx, p. 612.
1914. *Sphingonotus brunneri*, Uvarov, Revue Russe d'Entom., xiv, p. 221.
1914. *Sphingonotus brunneri*, Werner, Sitz. Akad. Wiss. Wien, cxiii, Abt. i, p. 394.
1919. *Sphingonotus octofasciatus*, Innes Bey, Bull. Soc. Ent. Egypte, xi, p. 38 (footnote).
1919. *Sphingonotus quadrifasciatus*, Innes Bey., *l.c.*, pp. 45, 47.
1919. *Sphingonotus lameerei*, Storey, *l.c.*, p. 65.
1919. *Sphingonotus quadrifasciatus*, Storey, *l.c.*, p. 65.

S. Persia: Abadeh, vi-vii, 1916, 1 ♀ (P. Paschen); N. Persia: Shahurd (Stockholm Museum).

This beautiful species is so distinctly marked on the wings that the above synonymy cannot be subject to any doubts. The description of *O. obscurata*, though far from being good, is nevertheless quite sufficient to recognise in it the same insect, which has been more fully described by Saussure, as *S. brunneri* and the Walkerian name must be used for the species. Bolivar (*l.c.*) has stated already that *S. lameerei* is a pure synonym of *S. brunneri* and I entirely agree with him. Rehn's opinion (*l.c.*) that the species may be a mere geographical race of *S. satrapes* Sauss. seems to be founded not on a comparative study of both species, but on Finot's remark in his description of *S. lameerei* (*Lc.*), since the pronotal structure is quite different in *S. satrapes* and *S. obscuratus*. As for *S. quadrifasciatus* of Innes Bey, its diagnosis, although extremely poor, leaves no doubt that it refers to *S. obscuratus*; it is very odd that Innes Bey could not determine his insect by Saussure's keys and descriptions as *S. brunneri* which he does not mention at all; still more incomprehensible is his suggestion that Rehn's record of *S. lameerei* should be referred to *S. octofasciatus* while Rehn records the latter species, as well. I leave out of consideration *S. apicalis* Sauss.

which also seems to be very close to our species, because the material studied by me does not permit me to form a definite opinion on the value of characters used by Saussure to separate it from *S. brunneri.*

In the above synonymy I have intentionally avoided references to the Catalogue of Kirby, since that author brought such a confusion into the synonymy of species of this genus (he regarded, for instance, *S. balteatus* of Saussure as being not the same insect as *S. balteatus* of Serville though Saussure re-described Seville's type) that it is much simpler to compile a new list of synonyms, than to correct Kirby's mistakes.

The list of references given above includes, I believe, all reliable records of the species, which are known from a very large area, in fact from the whole of the Eremian region. The actual records are, as follows: Algerian Sahara (Einot, Werner), Egypt (Rehn, Innes Bey), Sinai (Walker), N. and S. Persia (my records in this paper), Asia Minor (Saussure's doubtful record), Transcaspia (Uvarov) and Semiretchye, E. Turkestan (Zubowsky, Ikonnikov). The species seems to be nowhere common as most records are based on single, or a few specimens; this may be explained, however, not only by the actual scarcity of the species, but also by its extreme wariness observed by Werner (*l.c.*).

It is very likely that an insect of such a wide distribution gives several geographical races, but more material is necessary before this question may be attacked successfully; I should like to mention only that the form occurring in Semiretchye is according to Zubowsky (*l.c.*) remarkable for the width of the wing fascia, while the form from Sahara has got the fascia comparatively narrow and the apical spots small; thus it seems not impossible that the name *lameerei* may be used as subspecific, while *apicalis* may also represent but a N. Persian sub-species of *S. obscuratus.*

7. *Sphingonotus balteatus* (Serv.).

1839. *Oedipoda balteata*, Serville, Ins. Orth., p. 734.
1870. *Oedipoda latifasciata*, Walker, Zoologist, xxviii, p. 2299.
1884. *Sphingonotus amaranthinus*, Saussure, Prodr. Oedip., p. 206.
1888. *Sphingonotus balteatus*, Saussure, Addit. ad Prodr. Oed., p. 86.
1919. *Sphingonotus bifasciatus*, Innes Bey, Bull. Soc. Ent. Egypte, xi, pp. 45, 48.

India: Perim Island (British Museum); Arabia: Aden (also).

This is another species of *Sphingonotus* about which there is a great deal of confusion, especially in Kirby's Catalogue, quotations from which it would be useless to give here. As the specimens from the Perim Island in the Gulf of Cambay are practically topotypical (the type was from Bombay) and agree in all details with Serville's original description, I believe myself justified in my attempt to clear up the synonymy of the species.*

O. latifasciata Walk. the type of which does not exist is undoubtedly conspecific with *balteatus* Serv., as Walker refers to his species the fig. 9 of Plate 7 in Savigny's "Description de l'Egypte" which represents *balteatus*, Saussure, in *Prodromus* described the species under the name *amaranthinus*, while he mistook for *balteatus* another smaller species which has been mistaken for *balteatus*, also by all other authors; since that species is not known to me from Asia, I abstain from its description here and will do it in my paper on Egyptian Orthoptera, now in preparation. In *Additamenta* Saussure redescribed Serville's type and stated that it is identical with his *amaranthinus*; Innes Bey introduced one more name for the same species, *S. bifasciatus*, which cannot be accepted since his only reason for doing it was that the name *balteatus* has been used by various authors for different species and therefore must be rejected.

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*As a matter of fact I did it once already (Bull. Mus. Caucase, xii, 1919, p. 157), but at that time I had not sufficiently mastered the general systematics of this difficult genus and relied too much on literature, so that I must revise now the conclusions reached then.

All the above synonyms are, however, to be regarded as such only when the species is studied, as a whole, since some of the names may be used in connection with different geographical races of *balteatus*. In fact, there is a remarkable tendency in this species to a geographical variation in the color of the basal disc of wings, and the British Museum material enables me to distinguish the following four sub-species :—

1. *S. balteatus balteatus* (Serv.)=*amaranthinus* Sauss.—Disc of the wings light violaceous ; hind tibiæ blue on the inside—Bombay, Perim Island, Aden.
2. *S. balteatus latifasciatus* (Walk.)=*bifasciatus* Inner.—Disc of the wings violet-rose ; hind tibiæ violet-rose on the inside.—Egypt ; Sinai.
3. *S. balteatus roseus*, sub-sp. n.—Disc of the wings light rose ; hind tibiæ rose on the inside.—Somali ; Massowah.
4. *S. balteatus himalayanus*, sub-sp. n.—Disc of the wings blue ; their fascia broader than in other races ; hind tibiæ bluish-grey on the inside.—Baltistan.

8. *Sphingonotus intutus* Sauss.

L. Persia : Abadeh (P. Paschen) ; Lar valley, viii, 1905 (E. Grant Duff ; British Museum).

The specimen from Abadeh has been recorded by me* as *S. balteatus*, but I believe now that the differences in the sculpture of the pronotum and in the shape of the discoidal vein given by Saussure for separating *S. intutus* from *S. balteatus* are of specific value. On the other hand, I am not clear about the differences between *S. persa* and the two species just mentioned, while *S. nebulosus* Sauss. (*nec.* F.-W. !) seems to me hardly the same insect as the one described under that name by Fischer v. Waldheim and suspiciously alike *S. intutus*. The whole question can hardly be settled without studying the types and checking their characters on large topotypical series of specimens.

9. *Tmethis saussurei violacea*, Uv.

S. Persia : Shiraz, Zarghun, Badgamir, 12. vi-2. vii, 1920 (J. E. B. Hotson).

I have described this insect †as a mere colour aberration, but all South Persian specimens seem to possess the colour characters separating them from more northern representatives of the species, and must be regarded as a distinct subspecies.

The typical sub-species has been recorded by M. Burr under the name of *Sphingonotus satrapes* (!) from Kermanbalk (Ent. Rec., xii, p. 240) and from Seir, near lac Urmia (Linn. Soc. Journ., Zool., xxvi, 1899, p. 417) in N. Persia ; this I may state on the strength of a study of his original specimens, now in the Oxford University Museum.

10. *Tmethis cinerascens* (St.).

Of this species I have studied a male co-type, for the loan of which I am obliged to Prof. Y. Sjöstedt of the Stockholm Museum, and it agrees well with my figure (Bull. Mus. Caucase, xii, 1918, p. 50, fig. 5), only the pronotum is less constricted in the prozona, and its median keel is not as distinct as in the figure. I must point out, however, that the shape of pronotum and, particularly, the degree of development of its keel is subject to unusual individual variation in this species. In fact, I had an opportunity of studying an extensive series of specimens in the Caucasian Museum in Tiflis, taken near Teheran at the same date and it con-

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Journal, Bombay Natural History Society, xxviii, p. 361.

† *l.c.*, p. 362.

tained all forms transitional between those with fully-crested pronotum and those with the keel very low in prozona and altogether obliterated in metazona.

Since the development of the pronotal keel is the only difference between the genera *Tmethis* and *Eremoplana*=*Eremopeza*, Sauss., of which *cinerascens* is the genotype, it is obvious that these genera must be united, while two more species included in *Eremopeza* later on, *vic. granulosa* (Walk.) and *brachycera*, Kirby, may be more conveniently transferred to the genus *Eremocharis* (see below) until a revision of the genera of this very little known group may be undertaken.

Stal has not given the exact locality of his types, which is Shahrud, N. Persia and Teheran (see above) is the only other locality whence the species is known.

11. *Tmethis hotsoni*, Uv..

Baluchistan: Nok-Chah, 70 miles S. of Kharan, about 5,500 ft. 23 vi, 1918, 1 ♀ (J. E. B. Hotson).

Another very well preserved specimen of this largest known species of *Tmethis* just described by me (see this Journal, xxviii, 1922, p. 363). I wonder if the insect described by Kirby (Fauna Brit. India, Acrid., p. 158) under the name *Sphingonotus gigas* from Quetta is not a *Tmethis*, in which case it must be conspecific with *T. hotsoni*; the description of *S. gigas* is, however, most unsatisfactory and nothing can be said as to what genus it belongs to, until the type which is in the Indian Museum, Calcutta, may be studied.

12. *Eremocharis brachycera* (Kirby.)

1914. *Eremopeza brachycera*, Kirby, Fauna Brit. India, Acrid., p. 159 fig. 110.

Baluchistan: Quetta 1 ♀ (type, British Museum); Kelat,—viii, 1917, 1 ♀ (J. E. B. Hotson); Har boi, 12, viii, 1917, 2 ♂ ♂ 3 ♀ ♀ (J. E. B. Hotson).

As the original description of this species by Kirby is very poor and in some respects even incorrect, I believe it useful to give a re-description of the type while the fresh material collected by Mr. J. E. B. Hotson enables me to draw some additional notes on the specific characters.

The characters of the type are, as follows:—

♀ Antennæ as long as the head and the prozona of pronotum put together consisting of elongated joints. Face vertical, rugulose and with scattered round granules; frontal ridge above the ocellum strongly compressed, narrow and not sulcate, seen in profile excised just below the ocellum, obliterate farther down. Vertex strongly sloping, scarcely impressed, with scattered indistinct granules and with a subobsolete, narrow longitudinal sulcus; its margins not raised, very obtuse; no frontal or temporal foveolae; radial postocular ridges composed of rounded granules; occiput with a very narrow median sulcus the margins of which are slightly raised and with several transverse ridges. Pronotum thick and depressed, in round granules, anterior margin obtusely produced in the middle, sinuate laterally and obsoletely crenulate; prozona tectiform, with the crest convex in profile, distinctly cut by transverse sulci and finely sulcate along the middle; median sulcus deep, placed just before the middle; metazona practically flat, with obsolete granules and rugosities, Elytra reaching to the hind-knees, coriaceous. Middle femora irregularly granose along the upper side. Hind femora with the upper carina obtusely serrate and undulate; upper outer area with several transverse granulated ridges and small round granules; lower carina irregularly undulate. Margins of pronotum, sternum and legs densely pilose. Fascia of the hind wings subobsolete, emitting a radial branch (which is omitted in Kirby's figure). The specimen is much discolored by alcohol and color characters of the type are of no value.

Amongst the specimens collected by Mr. Hotson a female from Kelat is very like the type in its dimensions but somewhat more rugose on the pronotum. Its elytra extend practically to the hind knees ; hind femora are clay-colored on the inside, with a bluish-grey transverse fascia on the base of the lower inner knee-lobe ; hind tibiæ on the inside with the base and a streak along the middle not reaching to the apex, bluish-grey ; their inner spines dark-brown on the inside with a paler preapical fascia. Specimens from Harboi (2 ♂ ♂, 3 ♀ ♀) are distinctly smaller and the elytra in the females extend only to the narrowed part of the femora, while in the males they reach to the hind knees ; hind femora are faintly reddish on the inside with the fascia on the base of the lower knee-lobe blackish-blue ; hind tibiæ with the inside bluish-grey basally and dirty-vinaceous in the rest, with the inner spines chocolate-brown on the inside, fasciated with brown before the apices. Wings are very faintly greenish in both forms which I hesitate to separate even as sub-species until the species is better known and the extent of its individual variability may be appreciated. The dimensions of the specimens studied by me are, as follows :—

	Quetta.	Kelat.	Harboi.	
	♀ (type.)	♀	♂	♀
Body	44mm.	45mm.	27mm.	37mm.
Pronotum ..	(the tip broken off.)	15	8	12·5
Elytron	27	24	16·5	14
Hind femur ..	21	20	12	14

13. *Tropidauchen edentulum*, sp. n.

(Plate I, fig. 2.)

♂. Head densely sabuloso-granose, frontal ridge in profile convex, obtusely excised in the middle ; seen from the front it is widened and foveolate at the fastigium, narrowed above the antennæ, somewhat widened below them, narrowed below the ocellum, gradually and not strongly widened towards the clypeus, which it does not reach, since its marigns are raised and regular above the ocellum only. Lateral facial keels obliterated. Fastigium of vertex strongly sloping, much longer than broad, open in front, with the anterior margins only smooth, while the lateral ones are granose like the whole of the head and feebly raised ; the surface impressed, with a fine, but distinct sulcus along the middle. Eyes oval-shaped, higher than the subocular distance. Pronotum moderately compressed with the crest comparatively thick, not lamelliform, regularly convex in profile ; its anterior angle not acute, reaching the line connecting hind margins of eyes ; the whole surface densely sabuloso-granose with irregularly scattered acute spine-like tubercles ; the sulci well distinct, but fine ; the foveolæ feebly developed, the first and the fourth one being almost obliterate ; hind angle of the pronotum acute, bituberculate, and not bidentate at the apex. Prosternal spine acutely conical, somewhat compressed laterally. Mesonotum and metanotum, as well as the first tergite sabuloso-granose, with very few small spine-like tubercles ; first tergite with the crest inflated and the hind angle moderately acute, obtusely denticulate ; tympanum large, oval-shaped ; second tergite sparsely sabuloso-granose, with but two pairs of pointed tubercles at the hind margin, the lower ones being very small ; the remaining tergites indistinctly rugulose, without grains or tubercles. Subgenital plate recurved, with the apex narrowly truncate and bituberculate. Hind femora with the carinæ but feebly dilated, distinctly narrowed apically ; upper margin strongly spined throughout, lower margin also spined, but the spines are shorter and less acute ; the surface of the externomedian area not granulose, that of the lower and upper areas sparsely sabuloso-granose.

General coloration grey ; abdomen beneath ochraceous. Hind femora with the lower inner area lead-colored. Hind tibiæ and the inside of their inner spines black ; outer spines tipped with brown. Hind tarsi grey.

Length of body 29; pronotum 14; hind femur 15 mm.

S. W. Persia: Abadeh, vii—viii, 1916 (P. Paschen).

The essential characters of the new species are to be seen in the pronotal crest more distinctly arched than in other species of the genus (with the exception of *T. securicolle*), in the sand-like granulation of the head, pronotum and basal parts of the abdomen, in the hind angle of the pronotum being bituberculate and not bispinose, in the conical prosternal spine, in the subgenital plate bituberculate apically, as well as in the coloration of hind legs.

14. *Tropidauchen sabulosum*, sp. n.

(Plate I, fig. 1.)

♀. Head very densely sabuloso-granose; frontal ridge in profile strongly convex in the upper half, very deeply excised in the middle and practically straight in the lower portion; seen from the front it is of the same structure as in *T. edentulum*, but suddenly and strongly widened just before the clypeus; its margins are fairly distinct throughout, though in the lower portion less regular. Fastigium of vertex strongly sloping, longer than broad, open apically, with the margins irregular and granulated; the surface not strongly impressed, irregularly rugulose in the hind portion, with a fine median sulcus. Eyes oval-shaped; their height distinctly less than the subocular distance. Pronotum moderately constricted, with the crest thick and low, practically straight in profile; the whole surface very densely sabuloso-granose, with a few scattered obtuse tubercles; sulci fine; foveolæ of the crest small; front angle distinctly less produced than in other species; hind angle extending just a little behind the mesonotum, bituberculate. Prosternal spine acutely conical, slightly curved backwards somewhat compressed laterally. Mesonotum, metanotum and two first tergites sabuloso-granose, with a few scattered obtuse tubercles; tympanum large, open; hind angles of tergites somewhat produced, moderately acute; hind tergites indistinctly rugulose and with sparse, minute granulation. Hind femora not strongly narrowed apically; upper carina with about 9-10 short oblique spines; lower carina undulated, with a few subobliterate short and blunt spines; the whole outer surface sabuloso-granose.

General coloration pale ochraceous-grey; all sternites of the, abdomen, as well as the tergites from the third backwards though less conspicuously, variegated with black and brownish-orange colors. Hind femora with the lower inner area grey. Hind tibiæ with the inside bluish-black turning blackish-violaceous near the apex; inner spines black; outer spines violaceous inwardly and grey outwardly. Hind tarsi inwardly violaceous.

Length of body 48; pronotum 15.5; hind femur 20 mm.

N. Persia: Kermanbalk (Miss Sykes; M. Burr's collection, in the Oxford University Museum).

This insect has been recorded by Burr (The Entom. Rec., xii, 1900, p. 241) under the name of *T. securicolle* Sauss., but it differs strongly from the latter species, as well as from other known ones by the shape of pronotal crest, by peculiar granulation and by the coloration of abdomen and hind legs.

The number of known species of *Tropidauchen* is thus raised to six, and the genus seems to be restricted to the ancient Iranian plateau, since there is only one species, *T. securicolle* which has been doubtfully recorded from Syria. Of course, there is a possibility that some of the known species may prove to be not more than geographical forms when large materials are studied, but in the meantime it is best to describe them carefully and to keep separately from each other.

Lyrotylus, gen. nov.

♀. Of middle size, robustly built. Antennæ short and thick. Face moderately reclinate, broad, rugose; frontal ridge depressed, with a lyra-shaped dilatation above the ocellum, parallel below it; its margins very distinct and callous throughout, and the surface feebly impressed, rugose. Fastigium of vertex strongly sloping, not separated from the frontal ridge, its margins subobliterate ; the surface not impressed but very coarsely punctured ; temporal foveolæ not at all impressed, large, very coarsely punctured. Lateral facial keels strongly raised, practically straight. Eyes irregularly-elliptical, the anterior margin being practically straight ; their vertical diameter twice as large as the horizontal one which equals to the subocular distance ; distance between the upper ends of the eyes is distinctly broader than their horizontal diameter. Pronotum thick, subcylindrical, somewhat narrowed in front, coarsely rugose ; its disc regularly convex both in transverse and in longitudinal direction, intersected by three deep sulci, metazona being about one-half of the profona, very broadly rounded behind ; median keel very low, subobliterated in the anterior part of the prozona and in the metazona ; no trace of lateral keels. Prosternal spine conical, blunt. Sternum distinctly broader than long, rugose ; mesosternal lobes as long as broad with the inner angles obtuse and rounded and the interspace widened posteriorly, subequal in width to one of the lobes. Elytra lateral, very short. Mesonotum and part of the metanotum concealed by the pronotum ; both of them, as well as the first abdominal segment are swollen, being of practically the same diameter as the pronotum, and rugose ; tympanum oval-shaped, open, covered by elytron. Hind femora thick, with the lower and upper carina acutely denticulated. Hind tibiæ feebly thickened and distinctly incurved towards the apex, armed with 8 spines on each side ; no outer apical spine ; the spurs short, but the inner ones are somewhat longer than the outer ones.

Genotype : *Lyrotylus persicus*, sp. n.

15. *Lyrotylus persicus*, sp. n.

(Plate I, figs. 3 and 4.)

♀. Brownish-ochraceous, shining. Antennæ brownish-black, not reaching the metazona. Pronotum with the hind margin somewhat swollen, callous, pale. Elytra parallel-sided, with the apex angulate, not quite reaching the hind margin of the tympanum, blackish at their base, rugosely reticulated, with the longitudinal veins scarcely perceptible, straight. Second and third tergites rugose, though less so than the first one. Hind femora pale ochraceous ; hind tibiæ brown, with the spines black-tipped.

Length of body (somewhat contracted) 34 ; pronotum 12 ; elytra 5 ; hind femora 16·5 mm.

S. W. Persia : Abadeh, vii—viii, 1916 (P. Paschen).

This remarkable insect belongs to the group *Teratodes*, but is at once distinguished from any other genus of that group by its cylindrical pronotum with but feebly developed carina, while in other genera the pronotum is more or less strongly compressed and its carina is developed into a high crest. The new genus is related to *Acrostegastes*, Karsch, of which one species is known from Zanzibar and two from Somaliland ; on the other hand, it is near to *Pelecinotus* Bol. represented by two South Indian species.

The shining, leathery surface of the insect suggests that it is hardly a member of the true desert fauna, and is more likely to occur in places with more or less dense vegetation.

16. *Leptacris filiformis*, Walk.

1870. *Leptacris filiformis*, Walker, Cat.Derm. Salt. Brit. Mus., iv, p. 676.

1902. *Capellea argenteovittata*, Bolivar, Ann. Soc. Ent. Fr., lxx, p. 616, pl. ix, fig. 33.

1914. *Leptacris greeni*, Kirby, Fauna Brit. India, Acrid., p. 211, Bombay India : 16, ix, 1911, 1 ♀ (N. B. Kinnear).

The type of *L. greeni* agrees in all details with Bolivar's description and figures of *C. argenteovittata,* and I believe that I am quite safe in applying to the species the Walkerian name *L. filiformis,* though the type of the latter is lost.

TETTIGONIIDÆ.

17. *Himerta kinneari,* sp. n.

(Plate I, fig. 6.)

♂. Of the size and coloration of *H. marginata,* Br. W., but differing from it strongly in the structure of the male genitalia. Last tergite large, narrowly sulcate along the middle, with the hind margin almost straight, very feebly and broadly sinuate, not obtusely excised as in *H. marginata.* Cerci shorter than in the latter species, their apical compressed portion practically straight and forming an obtuse rounded angle with the base. Subgenital plate with the lobes very long, strongly compressed and recurved, with the apices acute and turned outwardly, so that the apical portion of the plate when seen from behind is lyra-shaped.

♀ (paratype). Subgenital plate transverse, simply truncate behind. Ovipositor short, strongly recurved; its upper margin practically straight; lower margin regularly curved; disc rugulose.

Length of body ♂ 13, ♀ 13·5; pronotum ♂ ♀ 3; elytra ♂ 13, ♀ 16 wings ♂ 21, ♀ 25·5; hind femur ♂ (broken off), ♀ 18; ovipositor ♀ 4 mm.

Type ♂ from Bombay, 16, vii, 1917 (N. B. Kinnear); paratypes, 1 ♂ and 3 ♀ ♀ from Surat and Palamau (British Museum).

Since the male of the paratypic series agrees in its genitalia perfectly with the type, I do not hesitate in referring the females to the same species which is very close to *H. marginata* but easily separated by the above characters. I take much pleasure in naming this dainty insect after Mr. N. B. Kinnear who has found it, as well as some other new or interesting species, included in the collection of the Bombay Society.

18. *Letana nigrosparsa* (Walk.).

1871. *Phanerophera nigrosparsa,* Walker, Cat. Derm. Salt. Brit. Mus v., Suppl., p. 39.

1878. *Pyrrhicia connata,* Brunner, Mon. Phaner., p. 116.

India: Chikalda, Berar, 3,664 ft., 17, ii, 1913, 1 ♀ (N. B. Kinnear).

The type of *Ph. nigrosparsa* Walk. is a male from Bombay in a very good state of preservation and it agrees perfectly well with Brunner's description of *P. connata.*

19. *Morsimus carinatus* (Walk.).

1870. *Aprion carinatum,* Walker, Cat. Derm. Salt. Brit. Mus., iii, p. 426.

1871. *Aprion strictum,* Walker, *l.c.*, v, Suppl., p. 45.

1871. *Aprion curvifrons,* Walker, *l.c.*, p. 45.

1895. *Aprion robustus,* Brunner, Mon. Pseudophyll., pp. 74, 76.

India: Malabar Hill, Bombay, 6, ii, 1918, 1 ♀ (W. S. Millard).

Kirby in his Catalogue has quite incorrectly regarded *carinatus* Walk. as distinct from *curvifrons* Walk. since the types of both species are undoubtedly conspecific; on the other hand, he was quite wrong in synonymising *A. gracile* Walk. and *A. oculatum* Sauss. and Pict. with *M. carinatus.*

Plicigera, gen. nov.

♀. Resembling in the general habitus to *Anonconotus,* and related to it.

Vertex subequal in width to one-third of the interocular distance; its fastigium separated from the front by a short transverse line. Pronotum obsoletely rugose;

lateral keels obtuse, but distinct except at the front margin; disc flat, narrowed anteriorly, with the median keel low, but distinct, interrupted at the V-shaped sulcus; hind margin scarcely rounded; lateral lobes moderately inclined with the hind margin sinuate and the surface rugulose. Prosternum not armed. Sternal lobes thick, short, rounded. Elytra lateral. Abdomen with a distinct median carina, and with several series of elongated creases on the tergites. Subgenital plate short, convex, narrowly incised behind. Ovipositor gently recurved. Front and middle femora unarmed. Front tibiæ with one spine above on the outer margin, and one apical one. Hind femora with 2-3 spines below on the inner margin. Hind tibiæ with four apical spurs below; plantula of the hind tarsi short, but free.

Genotype: *Plicigera himalayana*, sp. n.

20. *Plicigera himalayana*, sp. n.

(Plate I, fig. 5).

♀ Brownish-castaneous, shining. Fastigium of vertex paler, but its sides blackish, as also are the first antennal joints from below. Postocular fasciæ and the upper portions of lateral pronotal lobes chocolate-brown, very shining. Elytra scarcely reaching to the hind margin of the first tergite, elliptical in shape. Pleuræ and sides of the abdomen pale castaneous, chocolate-brown and blackish in parts, very shining and smooth; the upper surface of the abdomen dull, rugulose, brownish-ochraceous, each tergite with 4—6 pairs of shining brown creases, about half as long as the tergite, and with a distinct median carina running throughout the abdomen. Last tergite more than twice as broad as long, broadly rounded, with a short incisure in the middle. Cerci conical, pointed. Subgenital plate strongly convex, scarcely longer than at the base broad; its apex narrowly incised as deep as one-third of its length; lobes rounded. Ovipositor subequal to the hind femur, feebly recurved. Hind femora with irregular striation of the inside, some small spots on the upper side of the base and an irregular fascia along the lower half of the outer side blackish-castaneous; 2—3 black spines on the lower inner margin in the apical half.

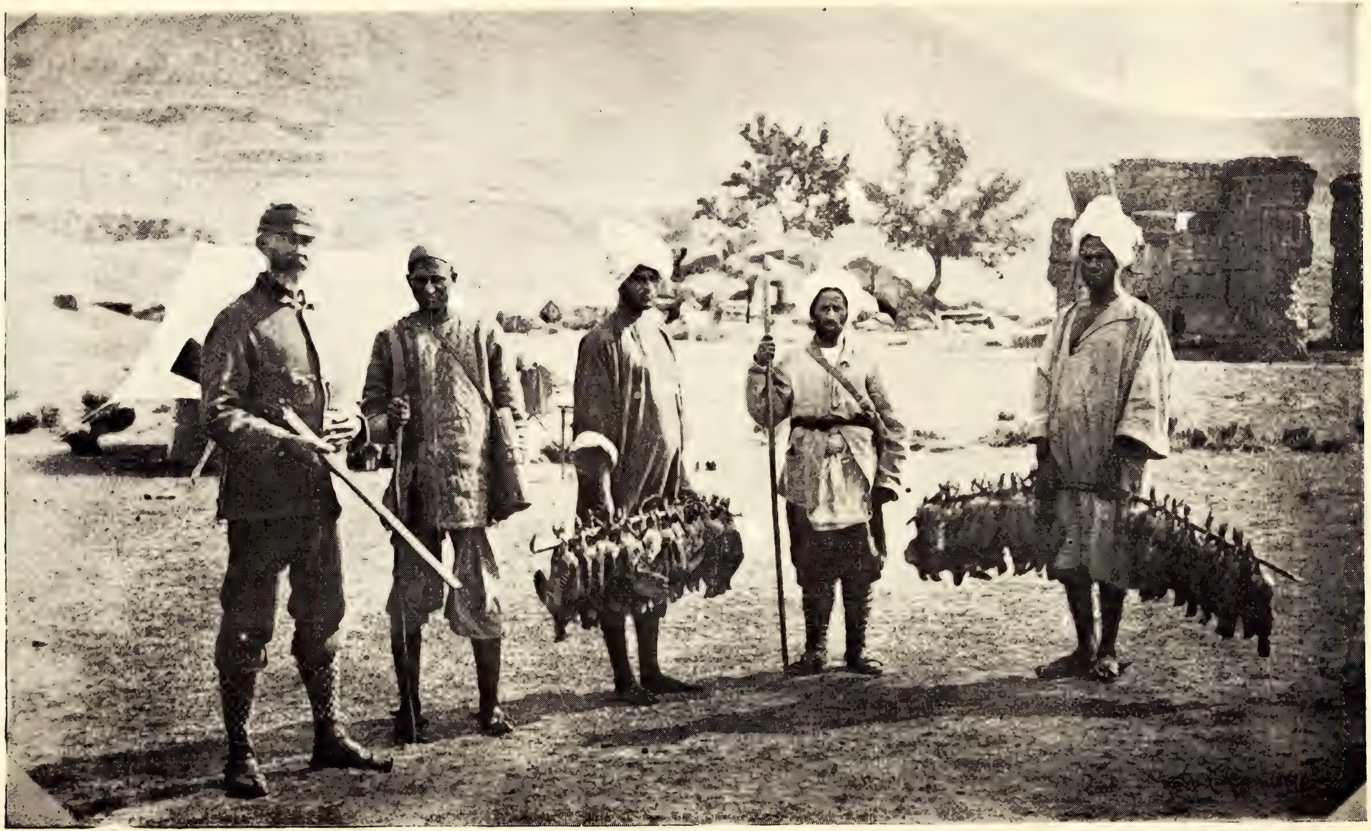
Length of body 21; pronotum 6·5; elytra 2·5; hind femora 19; ovipositor 17 mm.

Punjab: Dalhousie, x, 1917, 1 ♀ (N. B. Kinnear).

As I have mentioned in the description, this interesting Decticid is closely related to the genus *Anonconotus* represented by three species in the Alps and Apennines and supplies an evidence of some relationship of the Himalayan sub-alpine fauna to that of the Western Mediterranean mountains. The new genus is easily separated from *Anonconotus* by the peculiar sculpture of the abdomen, more developed pronotal keels, longer femora and differently built subgenital plate of the female; further characters may be found after a study of the male which remains undiscovered.

Explanation of the plate.

1. *Tropidauchen sabulosum*, sp. n., ♀ × 1½.
2. *Tropidauchen edentulum*, sp. n., ♂ × 1½.
3. *Lyrotylus persicus*, g. & sp. n., ♀ × 1½.
4. *Lyrotylus persicus*, g. & sp. n., ♀ face. × 3.
5. *Himerta kinneari*, sp. n., external genitalia of the male. × 1½.
6. *Plicigera himalayana*, g. & sp. n., ♀; S—end of the abdomen from below. × 1½.



T. S. ALLAN WITH HIS FAMOUS "BAG" OF CHUKOR.

SMALL GAME SHOOTING IN KASHMIR AND THE ADJACENT HILL PROVINCES

By

Col. A. E. Ward.

(*with a Plate.*)

Many visitors to the 'Vale' are deterred from using a rifle owing to the cost of travelling on to the ground where large game is to be found, but nearly all carry smooth bores.

Geese, Ducks and various Waders abound during the small game shooting season which extends from about September to April.

As the open time varies for different kinds of birds, rules must be obtained from the Secretary of the Game Preservation Department at Srinagar, or from the Forest Officers concerned if the ground is outside the Jammu and Kashmir State.

The following list contains the names of the birds which are fairly common, a complete list of the Game Birds and Water Fowl will be published in the next series of articles. Many of the Ducks and Waders are rare, as also are a few of the Partridges indeed so rare that the great majority of sportsmen do not know of their existence.

The Waterfowl.

The Mute Swan, the Greylag, the White-fronted Goose, the Bar-headed Goose (in Ladak), the Ruddy Sheldrake or Brahminy, the Mallard, Gadwall, Common Teal, Wigeon, Pintail, Garganey or Blue-winged Teal, Shoveller, Marbled Duck, Pochards including the Red-crested, Dun Bird, White-eyed and Tufted-Pochard, the Stiff-tail or White-headed Duck (in some seasons fairly plentiful), the Smew and Goosander.

An idea of the number of birds obtained during various months is afforded by extracts from the Hokarsar shooting book.

Compiled from two years shooting in His Highness', Hokarsar Reserve.

Name of Bird.	October.	November.	Dec.	Jan.	Feb.	March.	April.
Mallard	122	259	223	29	59	227	5
Pochards ..	562	137	139	49	221	270	66
Teal	1,819	1,021	488	77	203	821	114
Gadwall	86	345	286	18	732	273	19
Pintail	36	5	..	..	1	3	..
Wigeon	36	61	25	..	1	43	..
Shovellers ..	115	118	30	3	..	36	2
Geese	21	77	31	1	..	8	22
Various	4	28	25	3	21	27	6
Total ..	2,801	2,051	1,247	180	1,238	1,708	234
Average for one year	1,400	1,025	623	90	619	854	117— 4,638
	In some years the total bag exceeds ..						6,000

From the above it is evident that the autumn is the best time; in January when many of the swamps are frozen numbers of wild fowl depart. In February and March the Ducks return from the Punjab. Under the heading "various" a few white fronted Geese, Marbled and Tufted Duck are grouped, also two Sheldrake, 2 Cotton Teal, 2 Spot-billed Ducks, Stiff-tailed Duck, and Scaup, also one Clucking Teal.

The Bar-headed Goose is seldom to be seen in Kashmir, it migrates from Ladak to India.

Amongst those who have gone in for making large bags of ducks and geese are Mr. T. M. Kennard, Sir Robert Harvey and Major C. P. Radclyffe, the last made a bag of 6,998 ducks and geese including about 2,000 Mallard. Kennard's and Harvey's bags are not available but they numbered about 6,500 to 7,000 head. Major Radclyffe and Sir Robert used shoulder guns. In order to make these huge bags, it is necessary to live in a houseboat near the Walar Lake and the adjacent swamps, to subsidise the local shikaries so as to keep them off the jhils, and to flood swamps which are not deep enough, having done all this, shelters with platforms and sunken tubs are put down, decoy ducks are bought and a few grey-leg geese are caught, then on promising days, one of the shelters is occupied and the adjacent swamps driven. When the wind is high and rain sqalls come, the wild fowl do not stay in the big lake, they flight into the swamps.

A wonderful bag made by Kennard in one day with 12 bore guns was 129 grey-leg geese but this was on a reserved swamp. This form of sport does not however appeal to everyone nor perhaps does the expenditure it entails.

A pleasant way of spending 2 or 3 months is to go with a friend down stream from Srinagar to the swampy country, when the weather is suitable hide a boat in the reeds and have a day's shoot. On sunny days work the adjacent hills for Chukor, and have a try for the snipe. Wooden decoys can be made and painted to resemble some sort of Duck or Teal, they can be kept in position by a string with a weight attached. If live decoys are used they should be tethered to a peg driven deep into the mud, but the top of this peg must be below water, if not the ducks may wind the string round the top of the pegs and break their legs.

SNIPE.

The Fantail, Solitary and Jack Snipe.

The Fantail Snipe frequents very difficult ground and the birds are as a rule driven over the guns, located either in boats or on the edge of the swamps. The boatmen and those villagers who live near the jhils are very expert in making their way through quaking bog, the surface bends and the water comes through as they move along on their pattens aided by a short paddle, but they seldom go through.

Very large bags of snipe are not to be made. The birds begin to arrive late in August, the majority migrate in April. A few remain to nest in the more sequestered swamps. The Himalayan Solitary Snipe is found in the winter, but seldom stays in the summer. In very severe weather this Snipe comes low down, but as a rule it is not found under 6,000′. It seldom stays to breed. As many as 3½ couple have been shot in a small area, there are however very few places where more than one or two birds can be occasionally found.

The Jack Snipe arrives during August, and leaves in March and April for the northern countries such as Lapland, etc., where it breeds.

The beaters pass over many birds, lying close in the tufts of grass, consequently not many Jacks come forward over the boats and the short flight taken by the bird makes the driving difficult.

WOOD COCK.

The Woodcock breeds in Kashmir, a certain number stay through the winter. Evidence from records of game bags, made during the year, shows that it is unlikely that more than half a dozen can be shot by one gun in a season.

WADERS.

The Common Bittern, the Common and the Demoiselle Crane, the Little Bustard (rare), the Greenshank, the Eastern and European Golden Plovers, the Lapwing and the Stone Curlew.

BIRDS WHICH FREQUENT THE DRY GROUND.

The Southern Green Pigeon (not found in Kashmir Valley), the Kokla (Kishtwar and Poonch and as far up as Chakote on the Murree route), the Indian Blue-winged Pigeon, the Blue Rock, the Blue Hill Pigeon, the Eastern Stock and the Snow Pigeon, the Speckled Wood Pigeon (chiefly to the eastward), the Cushat (in Murree, Poonch and Kishtwar).

The Blue Rock comes to the fields under the hills in the early mornings, when if the gunner is successful at the first shot the birds will often circle round looking at their wounded or dead pals, thus giving the opportunity of putting in two or three more shots. In very severe winters the Snow Pigeon and the Blue Hill Pigeon come low down, but are not to be found in any numbers. On the Ladak Road flight shooting at the blue hill bird can be sometimes got. The Speckled Wood Pigeon is rare and can be got only by chance.

The Cushat visits the Oak woods in Poonch in large numbers when the acorns are ripe.

SANDGROUSE.

The Large Sandgrouse is rare. The Painted Sandgrouse is found in Jammu as also is the Common Sandgrouse. The Tibetan Sandgrouse is in Northern Ladak during the summer.

Colonel Unwin states that the Large Sandgrouse is seen in Pampur in November and that the birds are to be observed flying in flocks. The Common Sandgrouse is not rare in Poonch and the late Raja Sir Amar Singh got them in the low ground in Jammu. Now and again a bird or two can be shot in the bare country bordering the Jhelum river above Srinagar.

The Three-toed Tibetan Sandgrouse, as stated, comes to Northern Ladak and Central Asia where it breeds late in June. These birds can be heard as they flight in at night and can be looked up in the morning, they seem to be rather exhausted and are very tame. After living on antelope flesh and soup the grouse make a welcome change of diet, there is no harm done in shooting them when they first arrive, but it is not long before they pair off and nest.

PHEASANTS.

The Cheer, Koklass, the White Crested Kalij, the Monal and Western Tragopan.

The Cheer is nowhere common, a few birds can be shot in the lower ranges. The Koklass is found in nearly all the forests, so also is the Monal, notably in Kishtwar and the Kajnag.

The only method of getting decent shooting is by using dogs which will range rather wild whilst working up hill above the gun. Driving the nullahs with coolies is not often very successful, unless in the Autumn when the pheasants are congregated in the wild balsam, the seeds of which they eat in large quantities.

In some parts of Kishtwar and in Kashmir where villages have been deserted the wild hemp flourishes. In the early morning the Monal frequent the abandoned fields, thus occasioning the rather rare experience of walking up the Pheasants and shooting them as they rise. It is a tame business but there is a satisfaction in getting square with birds which as a rule are only to be got after much climbing.

When the snow is soft and the Pheasants are frightened by a hawk they will dash downwards and partly bury themselves in the soft snow as they pitch but this can seldom be seen unless the sportsman is wintering out in the hills.

The Western Horned-Pheasant or Tragopan is now very rare, though it still exists in Kashmir and in Poonch.

The Pheasant shooting in the United Provinces and the Punjab Hills is far superior to that obtainable in any part of Kashmir territory. There is no finer sport provided, the dogs used are up to their work and birds are reasonably numerous. The morning air is delightful, the dogs are keen when, as their eager yapping shows, they have got the scent, the birds give sporting shots and when your retriever brings from some distance down the hillside a Himalayan Pheasant all seems joy. There is always a drawback, however, and in this case it is the leopard, in the mornings there is not so much danger, but in the evenings many a pet dog has been snapped up by the ' pards. ' A red retriever now lying under the writing table was seized by a leopard during his first day out, a spiked collar saved his life, since then he has had many a day's sport but has been lucky.

A Sussex spaniel was pounced upon and taken up in the leopard's mouth, but dropped when fired at with No. 5 shot.

PARTRIDGES.

The Common Hill Partridge is found in Kishtwar, Badanwar and Poonch• The Chukor and the Black Partridge in the lower ranges and plains. The Grey in the plains. The See-See is found in Hazara and the border districts. The Tibetan Partridge in the high mountains of northern Ladak. The Snow Partridge occurs at high altitudes but is very rare, its habitat is to the Eastward. The Ram-Chukor or Himalayan Snow Cock and the Tibetan Snow Cock (a much smaller bird) are both to be obtained.

Ram-Chukor can be shot in the winter and spring, either by potting them with a small bore rifle or by stalking and putting them up, but the number killed in any one season is very small. There is little to be done as regard partridge shooting except perhaps chukor and, in a few favourite spots, the black partridge.

CHUKOR SHOOTING.

Chukor shooting is an ' Art.' The reason why the average visitor gets so few is because he knows but little of the habits of this elusive bird.

It is not in the least use trying long drives; when put up the covey swings round one or perhaps two spurs and then pitches ; if the birds squat and are again flushed they fly back over the beaters or, as is generally the case, they run up hill at once and are clear above the driving line in a very short space of time.

Two guns generally can do as well as three, if there are more it is very difficult to keep in line when walking along the hill side with the beaters. The top gun nearly always gets over the spur long before the lower gun can get round the contour he has to follow below. The birds see or are put up by the top gun and are gone long before the lower gun is within shot.

If three guns are out together it is sometimes advisable for the lowest gun to go on ahead. As the line advances he will get many cross shots. If the birds fly round a spur they very probably will spread into the nearest ravine affording cover, the lower gun then gets his chance, if he stands below as the line advances into the cover, he gets cross shots one after the other, the upper gun, if he stops at the bush or grass cover, will get shots as the birds rise ; if two good shots are out, and are working in concord, it will be practically the end of the covey's career.

Go slow when after Chukor ; it is also necessary to remember, especially on a fairly open hill side, that the birds will probably run down hill and that as they start they acquire a good deal of speed, hence the pace is great. When a partridge rises off the flat there is a deal of bustle, but on a hill side the Chukor launches itself straight into the air.

When the birds pass high over head they may give you a second shot. It is a mistake to let them come too close over, as it is not easy to turn round on ground covered with loose stones in order to fire the second barrel.

The beauty of Chukor shooting is the diversity of shots, it is not possible to tell what line the birds may take, it is very common for them to rise high and swing back to where they came from.

In winter many of the old Cocks congregate high up in rocks, by shooting them good is done, there are nearly always too many male birds.

Early in the season when the mother and young birds are low down, let the old hen go, the brood are probably quite big enough to feed themselves, but they will miss the fostering care which teaches them to go to the rocky ground where they will be comparatively free from danger at night. To shoot Chukor successfully takes a lot of practical experience, when that is gained there is no better sport. As much bad language is used on a hill side whilst Chukor shooting as on a golf course. Shout as little as possible at the coolies, however aggravating they may be, the noise causes the birds to run up hill.

Big bags are still made, too big, especially towards the end of the shooting season, when the birds are down on the easy ground eating the green grass and the bulbs which are sprouting.

Thirty to forty brace to two guns, and twenty brace to a single gun can still be got, but it is high time to restrict the number to be shot in a day. Ten brace to a single gun and twenty to a party would be a fair allowance.

It is true that the birds have big clutches of eggs, fourteen were found in a nest above Achhabal, fourteen chicks were seen following the mother near Leh, but all the eggs at Achhabal were destroyed by crows, and only a small percentage of the fourteen chicks in Ladak probably arrived at maturity.

The best of the small game shooting in the Vale is much in the melting pot, the Chukor are decreasing in numbers whilst the goat-herding children who destroy hundreds of eggs are increasing.

Omitting exceptional years the following list will give an idea of what may be expected:—

	Geese.	Duck and Teal.	Chukor.	Pheasants.	Snipe.	S. Snipe.	Woodcock.	Quail.	Pigeons.	Etc.	Total.
1	..	324	259	2	42	..	..	..	27	12	666
2	4	304	131	..	52	..	..	..	2	13	506
3	7	1,202	24	..	118	..	..	2	19	9	1,381
4	3	318	358	..	79	2	1	..	10	..	771
5	1	212	699	1	8	..	1	1	9	..	932
6	1	106	489	..	11	18	3	..	..	..	628
7	..	162	305	..	6	..	2	..	..	..	475

Note.—Geese, Duck, Teal and Snipe shot on the Reserve jhils have been omitted in the above figures.

QUAIL.

The Grey and the Black-breasted Quails, the Jungle-Bush, and Rock-Bush Quails.

The Grey Quail in the Valley of Kashmir only afford sport once in a decade, during the years that the Punjab is short of water the Quail may come into Kashmir and fairly large bags of 20 to 40 brace may be got but as a rule 2 to 4 brace is what may be expected. Last year 1921 was exceptionally good. The Sesamun called *Til-gogal* by the Kashmiri is the favourite food of the Grey Quail, but this oily seed spoils the birds for the table, and they are never plump. Near Tangrote and in parts of Jammu there is a fair shooting in March and April also in Poonch. There are generally a few quail in Kashmir throughout the year. The Black-breasted or Rain Quail is not a common visitor, during one summer a large number came to near the Manabal Lake and several remained to breed, this was in June 1904 and should be considered as very exceptional. As a rule the Western Punjab does not entice this bird.

The Bush Quails are common in Jammu and Poonch but are not as a rule shot by the sportsmen.

HARES.

In the low hills there are a few 'Indian Hares' and in Ladak and Baltistan others which will be described hereafter, these if required can be driven out of the patches of scrub jungle and easily shot, but during the summer they are breeding.

INDIAN DRAGONFLIES.

BY

MAJOR F. C. FRASER, I.M.S., F.E.S.

Part XVII.

(With 2 Plates and 4 Text-figures.)

(Continued from page 333 *of Vol. XXIX).*

Sub-Family—GOMPHINÆ—Continued.

Series—DIASTATOMMA, Williamson.

(=Legion—LINDENIA, Selys.)

This series contains five genera, two of which are well represented in India and a third is found up the Persian Gulf and will almost certainly be found to inhabit Sind. They form a compact group with the following characters :—

All trigones and hypertrigones traversed (and usually the subtrigone of the forewings also) ; *Miii* in the hindwing undulated ; *Rs.* and *Miv* with well marked accessory nervures ; stigma long and narrow, equal to one-third the distance from node to distal end of stigma ; membrane moderately large. Anal appendages, superior long, inferior much shorter. Genitalia : lamina broad and low, hamules with inner and outer branches, the former a robust hook, the latter thin and tonguelike, lobe more or less funnel-shaped. Vulvar scale short and cleft almost to the base.

Larvæ breeding in still or running waters, mask flat and broad, somewhat square, lateral lobes very robust armed with several robust teeth on the inner border and a moveable hook on the outer, no setæ. Antennæ short and clubbed usually of four segments, the last very minute. Abdomen strongly keeled on the dorsum, very broad short and flat on the ventral surface. Forelegs adapted for burrowing.

Genus—LINDENIA Selys ex De Haan.

Head transversely elongate ; occiput raised, nearly straight ; a slight depression separating labrum from the epistome. Wings long and narrow ; thorax broad and squarish ; legs moderately long and robust ; abdomen dilated at the base, segments 3 to 6 very narrow and cylindrical, 7 to 9 dilated and furnished laterally with broad winglike expansions, 10th segment very small, anal superior appendages longer than the 10th segment, straight and simple, inferior much shorter, deeply cleft. General colouring obscure, yellowish or bluish white with but few or no well defined markings.

Lindenia tetraphylla, Vander Lind.

Æschna tetraphylla, Vander Lind, Descrip. de l'Egypte nevrop. pl. 1. fig. 15, i, ii ; Selys, Mon. Lib. Eur., p. 32 (1825) ;

Lindenia tetraphylla, Selys, Mon. Lib. Eur., p. 76 (1840), Rev. Odon p. 102 (1850), Bull. Acad. Belg. xxi. (2), p. 96 (1854), Mon. Gomph. p. 298 (1857) ; Luc. Expl. Alg. iii., p. 128, t. 2. f. 7, 7a, b (1849) ; Ramb. Ins. Nevrop. p. 174 (1842).

Aeshna phyllum Eichw., Zool. Spec. i. ; p. 224, n. 2 (1829).

Ictinus praedator, Ramb. l.c., p. 173 (1842).

Lindenia quadrifoliata Eversm. Bull. Mosc. xxvii. (3) p. 194, t. l. fi. 7-9 details (1854) ; Mort. Ent. Monthly Mag. 3rd series, Vol. V. p. 149 (1919), Id. Ann. Mag. Nat. Hist. ser. 9, Vol. V, p. 295 (1920), Id. Ent. Monthly Mag. 3rd series, Vol. VI., p. 85 (1920).

Male: Abdomen (with appendages) 56 mm. Hindwing 39 mm.

Head. Labium, labrum and face white, mandibles black at base; occiput dark yellow in the centre, blackish outwardly; vertex greenish grey, black in front; frons bluish white, finely black at base in front of eyes which are greyish green, or in older specimens a pale opalescent brownish white. Whitish blue beneath, back of head black.

Prothorax pale whitish brown.

Thorax similarly coloured but clouded with blue laterally, marked with brown on the front and with black on the sides as follows:—2 median stripes coalescent above, diverging in front, a curved antehumeral band, the ends of which meet the median band and enclose an elongate spot of the ground colour, a black humeral band and two lateral black lines on the sutures, the median of which is broken at the spiracle but expands beneath it.

Abdomen similarly coloured to the thorax, segments 1 and 2 and the borders of the winglike expansions on segments 7 and 8 somewhat yellowish. The base of segment 1 clouded with dark brown and there may be subdorsal streaks of the same colour on segments 2 to 6; on some segments a short streak is seen crossing their middle, segments 3 to 9 have distinct dark brown apical rings which subdorsally are prolonged into the lateral bands. The rings are notched on the dorsal carina except on segments 8 and 9 where they form dark triangles, the apex directed basad. Anal appendages pale grey, thin long and cylindrical.

Legs bluish white, femora yellowish on the extensor surface, blackish on the flexor.

Wings hyaline, costa yellow, stigma yellow with dark brown borders. Membrane brown.

The ground colour and markings are subject to considerable variations due to age, adult specimens becoming more and more pruinosed until the markings are more or less or entirely obscured. Such latter types are an almost uniform putty colour.

Neuration. 3 to 4 cells in trigones of forewings where three veins meet in middle of cell, 3 cells in the hind which is traversed by 2 veins; subtrigone of forewing with 3 cells; discoidal field begins with a row of 4 cells and is then continued as rows of 2 cells; nodal index $\frac{8\text{-}17 \mid 17\text{-}10}{10\text{-}10 \mid 10\text{-}10}$; 4 or 5 cells in anal triangle

Female: Abdomen 48 mm. Hindwing 40 mm.

Very similar to the male but rather paler. The occiput yellow and outer part of head beyond eyes also yellowish; thorax has a yellow tint on the sides replacing the bluish. The 1st, 2nd and base of 3rd segments yellowish green, segment 2 having a broad subdorsal band of dark brownish orange prolonged for a short distance into base of 3, the dark spots on segments 7 to 9 better defined.

Anal appendages yellowish.

Hab. Persian Gulf and Mesopotamia, also South Europe, North Africa, Asia Minor and Persia. I have seen it taking long flights down the Persian Gulf during which time the exhausted insects would come aboard ships plying up and down the Gulf and would remain on board for some long time. Thus the insect is spread and carried along the Mekran coast and must ultimately reach the Indus. When discussing other Mesopotamian dragonflies I remarked on some that they would probably be found in Sind and therefore included them in our Indian list. Since then specimens of *Diplacodes lefebvrei* and *Selysiothemis nigra* have both been taken in Karachi and we shall probably hear of *L. tetraphylla* before long. The distribution is a very natural one, Sind and the river Indus having much in common with Mesopotamia and the Shat-el-Arab.

Lindenia tetraphylla is very nearly akin to the next genus *Ictinus* and must be regarded as an *Ictinus* modified by the influence of its desert surroundings.

Genus—Ictinus, Ramb.

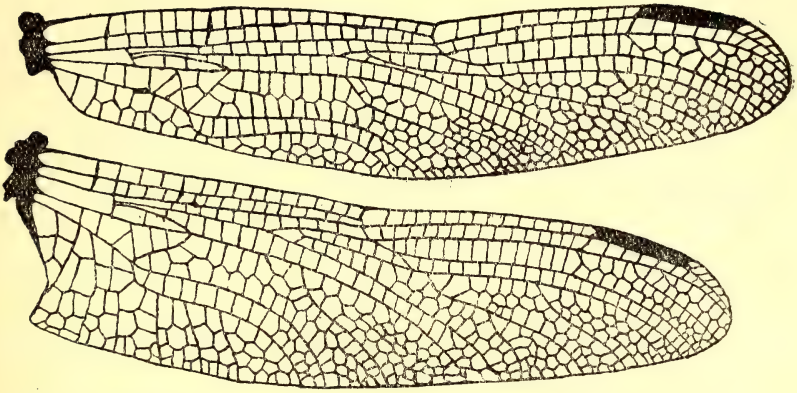


Fig. 1. Wings of *Ictinus rapax rapax*, Ramb.

Ictinus Ramb, Ins. Nevrop. p. 171 (1842); Selys, Bull. Acad. Belg. xxi (2), p. 86 (1854); Mon. Gomph. p. 263 (1857); Will. Proc. U.S. Nat. Hist. Mus. xxxiii., p. 278 (1908); Laid. Rec. Ind. Mus. Vol. xxiv, p. 373 (1922).

Head large and transversely elongate; vesicle very prominent, elevated into two robust points; thorax and abdomen black marked vividly with yellow; wings long and narrow, membrane narrow, stigma long, braced, trigones of forewing with 3 to 4 cells, subtrigone with 2 or 3 cells. Abdomen tumid at the base narrow and cylindrical from 3 to the basal half of 7, 8 and sometimes the apical half of 7 with wide lateral winglike prolongations, 9 and 10 narrow, the latter very small. Legs moderately long and robust.

Superior anal appendages straight, longer than segment 10, the inferior much shorter, deeply cleft. Genitalia and larvæ as for the series. Resting with head inclined downward, abdomen held in a strong scimitar-like curve. Both rapacious and pugnacious, often holding a resting place for days against all-comers. Breeding in still or running waters from sea-level to an altitude of over 3,000 ft.

Ictinus rapax rapax (Ramb)

(*Diastatomma rapax*) l.c.p. 169 (1842).

Ictinus rapax, Selys, l.c.p. 90 (1854); l.c.p.. 276 (1857) Kirby, Cat. Odon. p. 77 (1890); Will. l.c.p. 279 (1908); Laid. l.c. pp. 370, 375 (1922).

Male: Abdomen (with appendages) 52 mm. Hindwing 40 mm.

Head. Eyes bluish grey; labrum yellow bordered with brownish; labrum either yellow with a heavy black border and a median prolongation of black from the base which nearly cuts the yellow in two, or black with two large lateral yellow spots, the median prolongation in this case meeting the black on anterior border of labrum. Face and frons greenish yellow with a black stripe traversing the lower part of front or frons and expanding upwards at its middle to cut the yellow into two large lateral triangular spots; anteclypeus yellow, postclypeus black with a large lateral spot of yellow on either side; a black spot at the base of frons above in the middle line which does not extend as far forwards as the crest; vertex black; occiput greenish yellow fringed with short yellow hairs.

Prothorax black marked with yellow.

Thorax black marked with yellow or greenish yellow as follows:—a complete mesothoracic collar, oblique dorsal spots short and broad above, pointed below where it is widely separated from the mesothoracic collar, a large central spot in alar sinus, yellow spots on tergum, a humeral stripe represented by an upper triangular spot and often a lower broad streak, laterally yellowish green with a median broad black stripe and the posterior border of the metepimeron narrowly. Vestiges of a third yellow stripe on the median lateral band of black, sometimes an upper spot of yellow, sometimes an upper and lower or again a row of three yellow spots (I have never seen a complete yellow band.)

Wings hyaline and clear but in adults they may be slightly enfumed. Stigma black braced long over 5 to 6 cells ; trigones of forewings with 4 cells, 3 in the hind; subtrigone of forewing with 2 cells, only 1 in the hind ; hypertrigones traversed once or twice ; membrane whitish ; nodal index $\frac{23\text{-}13 \mid 21\text{-}12}{14\text{-}16 \mid 15\text{-}13}$; 3 cubital cells in the forewing, 2 in the hind ; 5 cells in anal triangle. Discoidal field begins with a row of 4 cells and continued as rows of 2.

Legs black, coxæ and trochanters yellow and a stripe of the same colour on flexor surface of anterior femora ; hind femora extending just beyond hind margin of thorax, furnished with an inner and outer row of spines, the inner closely-set and numerous at the base, gradually lengthening and more widely spaced towards the apex, outer row closely-set and small near the base, followed by 5 or 6 robust widely spaced gradually lengthening and then gradually shortening spines.

Abdomen black marked with bright yellow as follows :—segment 1 with an apical dorsal stripe confluent with a large triangular spot on dorsum of 2, a narrow lateral apical stripe on 1 confluent with a broad lateral spot on segment 2 which involves but does not pass beyond the oreillet, 3 with nearly the basal half yellow, this turning to pure white low down on sides and beneath, 4 to 6 with large dorsal basal spots confluent across the middle line except at apices, the basal half of 7 yellow, rather more than half of 8, the black here indenting the yellow on dorsal carina, the leaflike expansions all black, 9 with a lateral basal stripe and a small apical lateral spot, 10 very variable, in a large number of specimens examined it was quite unmarked, in others a small subbasal subdorsal spot on either side and a dorsal subapical pair of small spots. Sometimes the basal spot is much lower down on the sides and in one specimen all four spots were actually joined up so as to form a bow-like stripe on sides and dorsum of segment.

Anal appendages black, as long as the two last segments, cylindrical and tapering. Inferior much shorter, deeply bifid, black.

Genitalia : lamina tumid, broad and deeply cupped along free border, internal hamules robust hooks, external short flat and tonguelike, all hidden beneath a fringe of stout bright yellow hairs directed inward and meshing across the genital orifice, lobe short trowel-shaped.

Female :

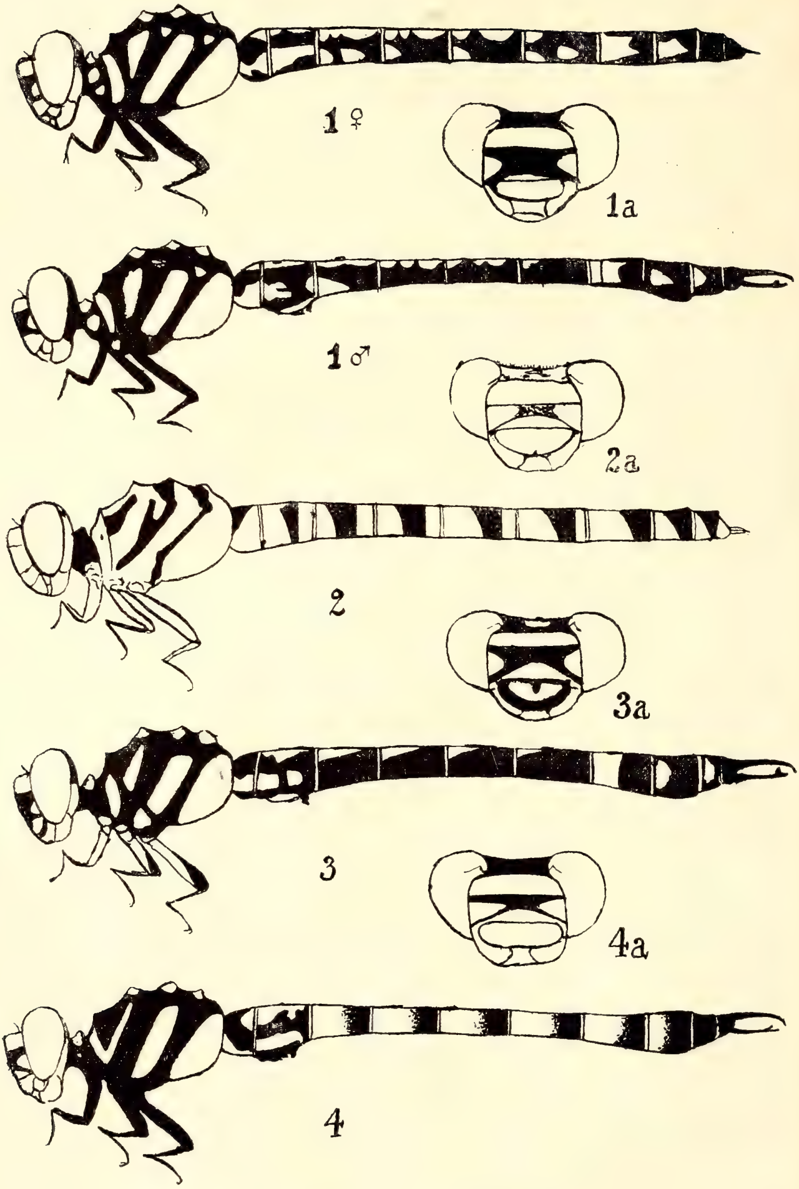
Abdomen 50 mm. Hindwing 42-44 mm.

Very similar to the male, yellow markings more extensive, abdomen much stouter, laterally compressed and shorter. The humeral stripe is nearly always almost complete and the lateral black band is always spotted, and there may be an almost complete yellow stripe here. Segment 10 is usually entirely black. Anal appendages short, conical black.

Occiput raised, a robust spine situated at its middle which in some specimens is minutely bifid, black, the floor of occiput yellow.

Wings with a dark brown basal marking extending out as far as the 1st antenodal nervure. This is often present also in the male but never so well defined as in the female. Vulvar scale black deeply cleft into two narrow tonguelike processes which extend nearly to the base of segment 10.

Hab. Throughout India save in the desert tracts, Burmah, Ceylon and the Andamans. In the Deccan it breeds in running water and I found exuvia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INDIAN DRAGONFLIES.

For explanation see end of article.

commonly along the borders of the Mullah Canal, Poona, which has a three or four knot current. In Coorg however I have lately found it breeding in large tanks around the borders of which it is very common.

Here it may be seen perched on a prominent twig facing out to the water, head inclined downward and abdomen held well up. Should it be disturbed either by a rival, a passing female or by the collector, it dives gracefully towards the surface of the water and then banks and turns flying swiftly off along the borders of the pond or stream. If disturbed it usually returns to its resting place again and again or settles close by until the danger is past when it again returns to its first resting place. Females are rarely seen and then only when coming to oviposit, their stay then is of very brief duration. Pairing takes place over water, is not of more than a minute or two's duration, after which a few eggs are deposited by swift dips over the water, the insect then rising and disappearing high over the tops of neighbouring trees. Unlike most *Gomphines* the males frequently engage in fierce combat especially if females are frequenting their locality.

The two following species are separated with difficulty from true *rapax* and cannot be regarded as of more than local race value. I have seen them so frequently mixed up with *rapax* that I have come to regard them as mere varieties and an examination of the genitalia does not help one, these organs being identical in all.

Ictinus rapax mordax, Selys, l.c.p. 433 (1857).

Ictinus rapax, race (?) *mordax* Selys, l.c. Bull. Acad. Belg. (2) xxxv., p. 768 (1873); Kirby, Cat. Odon. p. 77 (1890); Will., l.c.p. 279 (1908); Laid., l.c.p. 373 (1922).

Abdomen 47 mm. Hindwing 42 mm.

Differs from *rapax rapax* by the greater extent of yellow on the face. In a specimen I have from Malabar (female) the whole of the ante and post-clypeus is yellow save for two minute black points lying between them near the middle of face. The black basal spot on upper surface of frons is almost obsolete and the yellow of occiput is much more extensive, the spine being finer and markedly longer.

Selys mentions that the basal yellow ring on segment 9 is reduced to two lateral spots but it is very rare to find a complete ring on this segment even in true *rapax* (The end segments of the type of *rapax* have been lost so we do not know what the markings were.)

The vestigial lateral yellow stripe marking the black lateral band is absent in the male of *mordax* but is well marked in the female.

Other points mentioned by Selys are a slightly longer stigma and the minute spines on the anal appendages less rudimentary, and lastly segment 10 entirely black.

Hab. The type is from Assam and was regarded by Selys at first, as nearly related to *I. melœnops* but was afterwards thought to be a mere variety of *rapax,* an opinion shared by Dr. Hagen. I have male specimens which may be regarded as this insect from Malabar and the female which is much more specifically distinct, is also from that part of India.

Ictinus rapax praecox, Hagen, Selys, Bull. Acad. Belg. xxi. (2) p. 89 (1854); (2) xlvi., p. 677 (1878); Mon. Gomph. p. 275 (1857); Kirby, l.c.p. 77 (1890); Will. l.c.p. 279 (1908); Laid. l.c.p. 373 (1922).

Male: Abdomen 53 mm. Hindwing 39 mm.

Differs from *rapax rapax* by the slightly longer abdomen and the slightly shorter wings. The superior appendages a little longer and less abruptly truncate. The lateral winglike expansions on segment 8 have the teeth more robust. Lastly the black at base of frons above is much more extensive and fuses with the black on front of frons.

The dorsal spots on segments 3 to 6 are shorter, whilst segment 10 has the same extensive yellow markings which I have described above as not uncommon in *rapax rapax*. Forewings with 20-21 antenodal nervures, 15 in the hind, 11-12 postnodal nervures in all wings. The basal brown clouding of wings is moderately marked.

Hab. Pondicherry, Himalayas. Type in Copenhagen Museum is from Pondicherry. Female unknown but I have two females which may be regarded as *præcox* both from Malabar. In one the black on upper surface of frons is hardy fused with the black on the front, whilst in the other the separation is hardly perceptible. In all other respects these two insects are identical with typical *rapax*.

Ictinus atrox, Selys, Bull. Acad. Belg. xxi. (2) p. 92 (1854); (2) xlvi. p. 677 (1878); Mon. Gomph. p. 282 (1857); Kirby, l.c.p. 77 (1890); Will l.c.p. 279 (1908); Laid. l.c.pp. 370,374 (1922).

A single male in the Pusa collection, probably from Bihar.

Male: Abdomen 51 mm. Hindwing 41·5 mm.

Head. Labium yellowish; labrum, face and frons yellow, the labrum very finely bordered with black, a fine transverse line across lower part of frons and two tiny spots of black below this. Above frons, black at base; vertex and occiput yellow, a black stripe crossing the former just behind the ocelli.

Prothorax black marked with yellow laterally.

Thorax black in front marked with yellow as follows:—a complete mesothoracic collar, oblique broad dorsal stripes not meeting the alar sinus above nor the collar below, the alar sinus and, a complete humeral stripe slightly, constricted about its middle. Laterally broadly yellow marked with fine black lines on the anterior and posterior lateral sutures. Legs entirely yellow with black spines.

Wings hyaline, tinted with yellow, a basal dark brown mark extends as far out as the first antenodal nervure; stigma yellow, 7 mm. membrane ashy grey.

Abdomen black marked with yellow as follows:—segment 1 entirely yellow, 2 with a broad triangular spot, its apex just reaching the apical border of segment and its basal angles fusing with a broad lateral stripe which involves the oreillets and extends from base to apical border of segment, segments 3 to 7 with the basal half of each yellow, segment 8 with very large wing-like lateral processes of which the base is broadly yellow, this continuous with a broad yellow annule covering rather more than the basal half of the segment, 9 and 10 have narrow basal annules which extend apicalward on the sides of each segment.

Anal appendages very similar to those of *rapax*, black.

Female:

Abdomen 54 mm. Hindwing 44 mm. Stigma 6 mm.

Lips and face reddish yellow changing to citron yellow on the frons which has a fine sinuous basal black band slightly notched before the ocelli; vertex and occiput yellow, the former margined with black in front, the latter margined with brown, its border concave, with a small spine on either side of the concavity, fringed on the outer side of spines with fine yellow hairs; back of eyes glossy black with a lateral vestigial yellow spot.

Prothorax black broadly bordered with dark yellow on each side.

Thorax black marked with yellow as follows:—a complete mesothoracic collar, moderately narrow oblique dorsal bands pointed below and diverging widely but not meeting the collar below, a humeral band a little tapered above, broader below and uninterrupted. The sides broadly yellow, the sutures only marked finely with black.

Legs yellow marked with black, femora reddish yellow the four anterior ones with an external black stripe broadening apically, the hinder pair with only a vestige of this and bearing two rows of black spines, the apical 5 of which are much longer than the others. Tibiæ and tarsi black.

Wings hyaline with a slight saffronation at the bases; costa yellow; stigma long, dark yellow between black nervures, over about 8 cells; membrane brownish; trigones in forewings with 3 cells formed by the confluence of three nervures in centre of trigone, trigone of hindwing with only 2 cells; discoidal field begins with a row of 3 cells in forewing, followed by rows of 2, in hind begins with 4 cells; nodal index $\frac{13\text{-}20 \mid 22\text{-}13}{15\text{-}18 \mid 16\text{-}15}$; subtrigone of forewing divided into 2 cells, that of hind entire, small.

Abdomen tumid at base, a little compressed, black marked with yellow as follows:—segment 1 has a transverse dorsal stripe and the sides yellow, 2 a dorsal stripe extending the full length of segment, very broad at base, tapering apically, the sides broadly yellow, 3 to 6 with the basal half yellow, the apical black extending basalwards for some distance along the sides, segment 7 with basal half yellow, the black encroaching slightly on the dorsum and more so on the sides, 8 with a fine basal black ring followed by a narrow yellow ring and then black as far as apical border, the yellow ring extending a little apicalwards on the sides, the winglike processes on this segment black narrowly yellow at the base, rounded, strongly denticulate except at bases segment 9 with a large dorsal black spot, its base at the apical border of segments tapering basad, the rest of segment yellow, segment 10 black, rather less than the apical half yellow, the apical border finely black.

Anal appendages black, longer than segment 10, fusiform pointed.

Vulvar scale dark yellow, deeply cleft to its base into two contiguous lamellæ pointed at apex.

Hab. The type (a female) is doubtfully from India or China. The male described above, which I think is undoubtedly conspecific with *atrox* is in the Pusa Museum and was probably taken in Bihar.

It is distinguished by the large amount of yellow both on the face and body. Selys remarks that it is nearly related to *angulosus* but the description of the latter insect, of which the male alone is known reads very differently from that of *atrox*. The armature of the female occiput differs from other species of *Ictinus*.

Ictinus angulosus, Selys, Bull. Acad. Belg. xxi. (2) p. 92 (1854); Mon. Gomph. p. 281 (1857); Kirby, l.c.p. 77 (1890); Will. l.c.p. 279 (1908); Laid. l.c.p. 374 (1922).

Male: Abdomen 53 mm. Hindwing 43 mm. Stigma 6 mm.

Head. Labium and labrum yellow with the borders finely black; rest of face and frons yellow with a vestige of black on anteclypeus, 2 small points on postclypeus and a large spot on front of frons, the latter above with a broad black basal line; vertex and occiput both yellow, the former black in front, the latter narrowly bordered with black. Back of eyes black with a large yellow spot above.

Prothorax almost entirely black.

Thorax black marked with yellow as follows:—a complete mesothoracic collar, broad dorsal oblique bands converging above and resting on the borders of the alar sinus, pointed below but not meeting the mesothoracic collar. Laterally broadly yellow, the sutures outlined in black. Tergum spotted with yellow.

Legs black, femora broadly yellow on the outer sides and a fine line of the same colour on outer sides of tibiæ; hind femora with 2 rows of spines, the distal 7 or 8 being much longer than the others.

Wings hyaline, bases clouded with dark brown as far out as the 1st antenodal nervure; costa finely yellow; stigma reddish brown; trigones of forewings with 3 cells, that of hind also 3 cells; 19 antenodal nervures and 11 postnodal in the forewings; membrane blackish brown especially at base. Base of wing deeply excavate, the tornal angle very prominent.

Abdomen black marked with yellow as follows:—segment 1 broadly yellow on dorsum, the marking constricted at its middle, 2 with a broad even dorsal stripe not extending as far as apex, the sides including oreillets broadly yellow, 3 to 6 with large yellow lanceolate basal spots, extending nearly to the apex on segment 3 and for about three-fourths the length of the others, 7 with a broad basal ring occupying the basal two-thirds of the segment, rather less than this on the sides, 8 with the basal half and its sides yellow, the moderately large leaf-like expansions entirely black, not visibly denticulate along borders, 9 black above, yellow laterally, 10 similarly coloured.

Anal appendages black, superior a little longer than segment 10, subcylindrical, excavate within, pointed, moderately divergent, inferior about half the length forked branched straight but separated.

Hab. India. Described from a male in the Saunders collection.

The abdominal markings are sufficiently distinctive to separate it from other Indian species. Female unknown.

Genus—GOMPHIDIA.

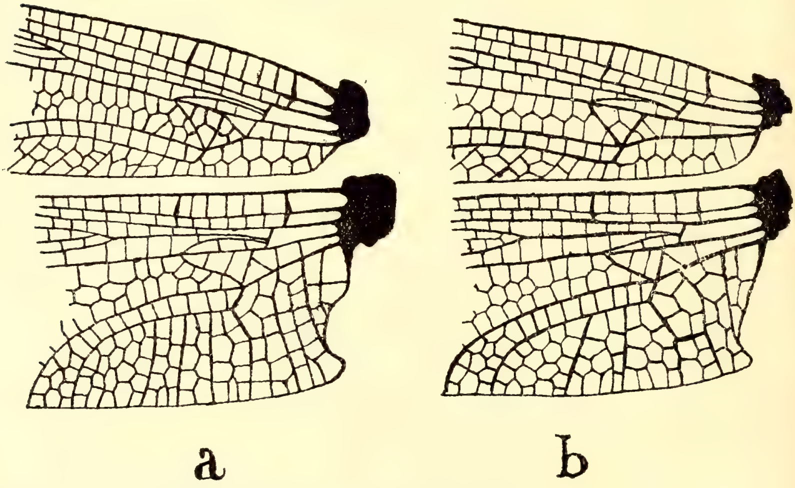

Fig. 2. a. Base of wings of *Gomphidia fletcheri*.
b. Base of wings of *Gomphidia williamsoni*.

Gomphidia, Selys, Bull. Acad. Belg. xxi. (2) p. 86 (1854); Mon. Gomph. p. 259 (1857); Will. l.c. p. 281 (1908); Laid. l.c. p. 374 (1922).

The genus is very nearly allied to *Ictinus* and species of the two genera closely resemble one another. They are readily distinguished by the absence of any leaf-like dilatations on the 8th abdominal segment, the abdomen especially of the male is rarely held curved scimitar-like to the extent it is seen in *Ictinus*.

Head transversely elongate, frons elevated and prominent, vesicle prominent, raised into two robust points on either side, occiput slightly raised but notched in the middle, in the female.

Thorax bulky, rather square, black marked with yellow or yellow marked with black; wings long and narrow, membrane narrow, stigma long braced, trigones of forewings with 3 to 4 cells, 3 in the hind, subtrigone of forewing with 2 or 3 cells, only 1 in the hind.

Abdomen tumid at the base, narrow and cylindrical thereafter as far as middle of segment 7 where it dilates as far as base of 9 after which it rapidly narrows again. *No leaf-like dilatations on sides of segment* 8. Segments 9 and 10 very short. Anal appendages, superior longer than segment 10, of even width, laterally compressed, inferior much shorter, cleft as far as base into two flat triangular diverging lamina, waved and directed upward as seen in profile. Legs robust, of moderate length, variably spined.

Genitalia. Lamina short broad depressed, hamules very prominent and projecting, the internal robust hooks, the external flat and tongue-like, lobe funnel shaped. Vulvar scale deeply cleft, its branches slightly divergent, extending nearly to base of segment 10.

Hab. Breeding in still or running waters, habits as for *Ictinus.* Larvæ very similar to *Ictinus.*

Gomphidia fletcheri, williamsoni and kodaguensis were not included in the key to the *Gomphinæ* as they were unknown at the time it was written.

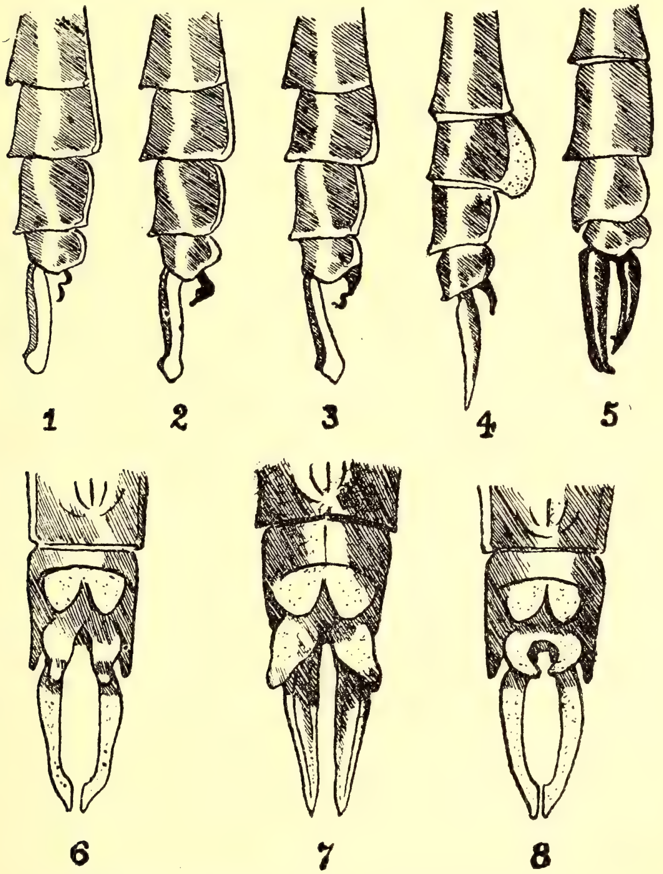

Fig. 3. Lateral view of end segments and anal appendages of :—
1. *Gomphidia fletcheri.* 2. *Gomphidia williamsoni.* 3. *Gomphidia T-nigrum* 4. *Ictinus rapax.* 5. *Heterogomphus hannyngtoni.*
Ventral view of end segments of abdomen and anal appendages of :—
6. *Gomphidia fletcheri.* 7. *Ictinus rapax.* 8. *Gomphidia williamsoni.*

Gomphidia T-nigrum Selys, Bull. Acad. Belg. xxi (2) p. 86 (1854); Mon. Gomph. p. 260 (1857); Kirby, Cat. Odon. p.76 (1890); Will. Proc. U.S. Nat. Mus. xxxiii, p. 282 (1908); Laid. Rec. Ind. Mus. Vol. xxiv, pp. 370, 374 (1922).

Male: Abdomen 53 mm. Hindwing 38 mm.

Head. Eyes bluish grey; lips, face and frons bright citron yellow, upper surface of frons marked with a black line in floor of sulcus, which forms a "T" by meeting a short medial transverse black line on front of frons; vertex black, the two points of vesicle yellow, occiput largely yellow, its hinder border raised, its floor filled by a pyramidal eminence.

Prothorax brownish black.

Thorax black marked broadly with bright yellow as follows:—a broad mesothoracic collar barely interrupted at its middle, two broad short dorsal oblique stripes pointed below and not meeting mesothoracic collar, the sides broadly yellow with a broad median black stripe marked above and below with a small upper and a large inferior spot of yellow. Humeral spot vestigial, represented only by a small upper spot, alar sinus black, the tergum spotted with yellow.

Legs black, coxæ and trochanters spotted with yellow. Hind femora with two rows of very robust evenly and widely spaced spines, longest at the middle of femora, crowded at the extreme base where they are very minute.

Wings hyaline, costa yellow as far as the stigma which is yellow bordered with black; trigone in forewing 3 cells long, the basal cell divided into 2 cells, 4 cells in all in the trigone, trigone in hindwing 3 cells long; nodal index $\frac{10\text{-}16|16\text{-}9}{9\text{-}12|12\text{-}10}$ 3 cubital cells in forewing, 2 in the hind; subtrigone in forewing 2 cells, that of the hind entire; anal triangle 5 cells.

Abdomen black broadly marked with yellow as follows:—segment 1 diffusely yellow on dorsum, segment 2 all yellow except for an irregular black ring at the apex which extends forwards on either side of dorsum and also below along the ventral border. Genitalia except the lamina bright yellow. Segments 3 to 6 with basal half yellow (rather less on segment 6), segment 7 and 8 with narrow black apical rings, broadest on 8, extending forwards along the ventral border on both segments; 9 has a fine lateral stripe at the base and the basal part of dorsal carina finely yellow, 10 has a small dorsal spot.

Anal appendages brownish, the superior longer than segment 9, broad at the base, compressed and of even width thereafter, bevelled at the apex, curving at first out and then in, the apices meeting; inferior one-third the length of superiors, seen in profile undulated, from below diverging and broadly triangular.

Genitalia very similar to that of *fletcheri* (to which this insect is more closely related than to other species, both by anal appendages and genitalia), lamina short and broad, bluntly pointed, somewhat excavate; internal hamules long tapering hooks, the apices curling a little outwards, external hamules long narrow and acute tongue-like processes, bright yellow in colour, projecting markedly from the genital sac and hugging the lobe, which is also yellow and broadly funnel-shaped.

Female: Abdomen 53 mm. Hindwing 43 mm.

Very similar to the male. Mandibles marked with black at the base; labrum all yellow; occiput concave at its middle, dorsum of segment 2 bears a triangular yellow spot, the other black markings of abdomen of greater extent, segment 9 without any dorsal stripe, 10 entirely black. Anal appendages short, conical, brownish.

Vulvar scale cleft for about three-fourths of its length, the divisions slightly divaricate, extending nearly to base of segment 10.

Hab. The type is from Northern India but the exact locality is unknown. (I have never received specimens of this insect from that part of India so that it must be either very rare or very local.)

Personally I have seen it in considerable numbers on the Katraj Lake, Poona, Deccan, where it has established itself. In flight it looks very like an *Ictinus* but its bright yellow colour is sufficient to distinguish it even on the wing. It patrols the borders of the lake for long distances, the males engaging each other in combat as they pass.

Gomphidia fletcheri, sp. nov.

Male : Abdomen (with anal appendages) 63 mm. Hindwing 42 mm.

Head. Eyes bottle green ; midlobe of labium brownish, lateral lobes yellow ; labrum black marked with two greenish yellow spots at the base ; face and frons greenish yellow, a black stripe across the lower part of front of frons which sends a prolongation up to meet a medial black marking on upper surface of frons occupying the floor of sulcus and expanding towards the vesicle ; vertex and occiput black, the former raised into two prominent points, the latter raised laterally and medially and fringed with pale coloured hairs.

Prothorax black marked with a yellow anterior collar.

Thorax black marked with greenish yellow as follows :—a broad mesothoracic collar interrupted in the middle line, very short and broad, oblique dorsal stripes rather widely separated from the mesothoracic collar. Laterally broadly yellowish green with a medial broad black band which is marked above and below by large yellow spots. Tergum spotted with yellow.

Legs black, coxæ and trochanters yellow, the hind femora with two rows of robust spines, short, numerous and crowded at the base, longest and widely-spaced at the middle and 5 or 6 short closely spaced ones at the apex.

Wings hyaline, enfumed somewhat patchily with warm brown ; stigma black, very long, over 6 to 7 cells, braced ; trigone in forewing 3 to 4 cells, 3 cells long, that of hindwing with 3 cells in a line ; hypertrigones traversed twice in all wings ; subtrigone in hindwing entire, in forewing formed of 3 cells by conjunction of 3 nervures at centre of cell ; nodal index.—$\frac{14\text{-}20 \mid 20\text{-}12}{14\text{-}14 \mid 16\text{-}14}$; $\frac{15\text{-}18 \mid 19\text{-}15}{14\text{-}14 \mid 14\text{-}14}$; 2 cubital nervures in hindwing, 3 to 4 in forewing ; 6 to 7 cells in anal triangle. (In the second specimen the trigones in forewings are 3 cells long and have only 3 cells and the subtrigones have only 2 cells.)

Abdomen black marked with yellow as follows :—segment 1 with a broad dorsal spot and a narrow apical streak low down on the sides confluent with a lateral spot on segment 2 which involves the oreillet and is limited apically by this structure ; genitalia tipped with yellow, segments 3 to 6 with elongate dorsal spots confluent over dorsal ridge except at extreme apices and gradually diminishing in size from 3 to 6, segment 3 has also the ventro-lateral border narrowly yellow, segment 7 has the basal half yellow, 8 has a complete narrow basal ring, 9 has a mere vestige of this and 10 is entirely unmarked.

Anal appendages black. Superior broad at base, compressed in apical half, apices bevelled off and turning in to meet each other. Inferior only one-third the length of superiors, undulated in profile, flat and triangular as seen from below.

Genitalia. Lobe rather flat, the border emarginate; internal hamules very long robust hooks ; external hamules long flat narrow tongue-like lobes projecting well out from the genital sac ; lobe funnel-shaped prominent, embraced on either side by the outer hamules.

Hab. Coorg. Two males taken at Hallery near Mercara on the borders of a rocky mountain stream, 3,800 ft. altitude. Both were very shy and unapproachable so that I finally had to bring them down with a charge of dust shot. They bear a close resemblance to *Ictinus* when on the wing or resting or to *Heterogomphus hannyngtoni* for which the insects were actually taken to be until secured and examined. When settled they rest with the head inclined somewhat downwards and the abdomen held stiffly and straight out, this latter feature distinguishing them from the curved scimitar-like abdomen of *Ictinus*.

Their large size will distinguish them from any other Indian species of *Gomphidia*; other oriental species approaching it in size are *krugeri*, Martin, which has the oblique dorsal stripes joined to an upper humeral spot, and *perakensis*, Laid., in which the ante and post-nodal nervures are much more numerous than *fletcheri*.

This magnificent species is named after Mr. T. Bainbrigge Fletcher in acknowledgment of his long and unstinted aid in contributing material which has much facilitated the preparation of this work.

Gomphidia williamsoni, sp. nov.

One female and several males from Hasimara, Duars, Bengal, coll. by Mr. H. V. O'Donel, 20.v.23— 6. vi.-23.

Male: Abdomen with appendages 54 mm. Hindwing 43 mm.

Head. Eyes bottle green; labium yellow; labrum black enclosing two moderately large yellow spots; frons greenish yellow above and in front, a medial basal spot of black sometimes present above but never extending as far forwards as the crest; face greenish yellow below, black above, this colour invading the yellow of front of frons so as to cut it into two lateral spots; vertex and occiput black.

Prothorax black with an anterior yellow collar.

Thorax black marked with greenish yellow as follows:—a mesothoracic collar slightly interrupted in the middle line, broad oval oblique dorsal stripes narrowing below where they may be connected to the mesothoracic collar or widely separated from it (separated in one male and in the single female examined; connected in two males); laterally two very broad greenish yellow stripes separated by a broad black stripe which is quite unmarked. The anterior yellow band sends a tongue-like process back above, which may have been formed by confluence with an upper yellow spot, the posterior stripe covers the whole of metepimeron; tergum spotted with yellow.

Wings hyaline, rather deeply enfumed with warm brown; costa black; stigma blackish brown, very long, braced; trigone in forewing four celled, four also in the hind; anal triangle with 5 cells; nodal index $\frac{10\text{-}20 \mid 18\text{-}11}{12\text{-}14 \mid 14\text{-}11}$.

Legs entirely black, the hind femora with two rows of robust spines which fuse to form a close field of smaller spines at the base.

Abdomen black marked with yellow as follows:—segment 1 with a dorsal apical triangle and an apical lateral spot low down on the sides, segment 2 with a broad dorsal stripe not quite reaching the apex, laterally a broad spot of yellow which just meets the dorsal spot at its base and extends to the ventro-lateral border below involving the oreillet, segments 3 to 6 with elongate dorsal spots confluent over the dorsal crest save for the extreme apex. These spots gradually decreasing in size from 3 to 6, the 3rd segment with a long basal streak low down on the sides, 7 has the basal half yellow, 8 a tiny lateral basal streak, 9 is unmarked, whilst 10 has a small rounded spot on the centre of the dorsum.

Anal appendages black, the superior long and sinuous, laterally compressed, blunt and bevelled at the apex, the inferior very much shorter, leaf-like and curling upwards as seen in profile, flat and triangular as seen from below.

Genitalia. Lamina deeply excavate, more pointed and longer than in *fletcheri*; internal hamules short robust hooks, much shorter than in *fletcheri*; external hamules broadly triangular flat and not markedly projecting from genital sac; lobe funnel-shaped. The external hamules and lobe are tipped with yellow.

Female: Abdomen 54 mm. Hindwing 45 mm.

Very similar to the male but the yellow markings broader and better defined. Wings rather more deeply enfumed; all trigones with 4 cells; nodal index

$\frac{13\text{-}20}{12\text{-}15}\Big|\frac{20\text{-}13.}{14\text{-}12.}$ Occiput raised, a small point at its centre, finer than that found in *Ictinus*; vesicle black marked with two small yellow spots. Dorsal oblique stripes widely separated from the mesothoracic collar; the black stripe, traversing sides of thorax, marked with a large lower spot. Segment 2 almost entirely yellow, the lateral band very broad and extending the entire length of the segment, the dorsal stripe also very broad in its basal two-thirds, the apical third connected to it by a narrow neck only; segment 9 has a fine lateral basal streak similar to that on 8, whilst segment 10 is unmarked.

Vulvar scale very characteristic, deeply cleft at base into two long narrow tongue-like foliate processes, the apices of which extend as far as the base of segment 10.

Anal appendages very short conical black.

Hab. Duars, Bengal. I am indebted to Mr. H.V. O'Donel for these specimens, the type of which will be sent to the British Museum. The species belongs to the *abbotti-kodaguensis* group, to both of which it is closely allied, especially to the latter. It differs from *kodaguensis* by the greenish-yellow on upper surface of frons not being divided up by black, this colour being either entirely absent or present as a very small spot at the base only. It also differs by the absence of an upper humeral spot and of spots on the lateral black band. From *abbotti* it differs by the absence of spots on the lateral black band of thorax and also by the absence of black on upper surface of frons, lastly by the much greater extent of yellow on segment 2, etc.

This species is named after Mr. E. B. Williamson who has done so much valuable work on the subfamily *Gomphinæ*.

Gomphidia kodaguensis sp. nov.

A single male, Dubarry, Cauvery river, Coorg, 21. vi. 23.

Male: Abdomen with appendages 53 mm. Hindwing 42 mm.

Head. Eyes bottle green; face and frons bright citron yellow, the latter with a black mark in floor of sulcus which is continuous with a black mark on the upper part and front of frons. This again is confluent with a transverse black line on lower part of front of frons, in other words the black on front of frons tapers rapidly and irregularly to meet the black on its upper surface, leaving a broad space of the ground colour on each side which is irregularly triangular in shape. Labium yellow; labrum yellow narrowly bordered with black, the ground colour split into two large spots by a medial vertical streak of black running from the base; occiput black raised, fringed with very short pale yellow hairs; vertex black, the vesicle elevated into two very acute prominent points.

Prothorax black with a narrow anterior collar of yellow.

Thorax black marked with yellow as follows:—a mesothoracic collar broadly broken in the middle line, two broad oval greenish yellow short dorsal stripes, pointed below and not nearly meeting the mesothoracic collar, a small upper spot representing the rudimentary humeral stripe. Laterally broad yellow stripes separated by a broad black stripe, marked by an upper and lower spot of yellow. The posterior yellow covers the whole of metepimeron. Tergum spotted yellow.

Legs black, coxæ, trochanters and anterior pair of femora yellow. Hind femora with two rows of widely separated robust spines, the two rows coalescing at base where they are small and crowded, mid femora with small evenly sized crowded spines.

Wings hyaline, costa black, the apices and posterior borders palely and evenly enfumed with warm brown; stigma very long, black; nodal index $\frac{13\text{-}22}{14\text{-}15}\Big|\frac{22\text{-}15}{15\text{-}13}$; trigones of forewings with 3 to 4 cells, 3 cells in the hind (traversed twice); 5 cells in the anal triangle ; 5 cubital nervures in forewing, 3 in the hind ; subtrigone in forewing traversed once, free in the hind ; hypertrigones traversed once or twice.

Abdomen black marked with yellow as follows :—segment 1 with a fine apical dorsal ring, 2 with a small oval dorsal spot extending from the base for two-thirds of the length of segment, and a small lateral spot which involves the oreillet. Subdorsally and subapically a very tiny yellow spot, segments 3 to 6 with dorsal basal elongate spots confluent over the dorsal crest except at the extreme apices, segment 3 has also a narrow basal streak of yellow along the ventrolateral border. Apices of lobe and external hamules also tipped with yellow. Segment 7 has the basal half yellow, 8 has an elongate transverse basal spot, 9 is unmarked, whilst 10 has a dorsal spot expanding apically and covering almost the entire dorsum.

Anal appendages black. Superior nearly as long as segments 9 and 10, laterally compressed, sinuously curved at first down and then slightly up, bluntly pointed at apex which is bevelled. Inferior only one-third the length of superiors, curling upward, undulated as seen in profile, broad and triangular as seen from below, markedly divergent branches.

Genitalia similar to that of *williamsoni* to which the insect is closely related, as also to *abbotti*, its markings being a combination of these two insects. It differs from both by having the face and lips almost entirely yellow and by the black on frons joining up with that on the upper surface. From *williamsoni* it again differs by the restricted yellow markings on segments 1 to 3 and by broader markings on segments 8 to 10. From *abbotti* by the greater number of antenodal nervures and by the vestigial humeral spot on thorax which is absent in *williamsoni*.

The single male was taken about a quarter of a mile inland from the Cauvery river in a dense teak plantation. I mistook it for an *Ictinus* but my curiosity was aroused by the curious locality in which I had found it.

The name is derived from the vernacular way of spelling " Coorg ", the latter being the English corruption of the word.

Gomphidia abbotti Will. l.c. pp. 282-285 (1908.)

Male : Abdomen 53 mm. Hindwing 4 mm.

Head. Eyes bluish green ; labium brownish ; labrum black marked with two large transversely oval lateral spots ; anteclypeus yellow, postclypeus black with a small lateral yellow spot ; frons black, its crest narrowly in front and the upper surface yellow, the sulcus black, this colour extending forward nearly to the crest (In the Burmah specimen, this black area is much restricted) ; occiput raised, black, fringed with short hairs.

Prothorax brown, yellowish laterally.

Thorax black marked with yellow as follows :—a mesothoracic collar slightly interrupted in the middle line, oblique dorsal spots resting on the alar sinus above, widely divaricate below, extending about halfway to the mesothoracic collar, humeral stripe entirely absent, laterally black marked with a narrow anterior stripe of yellow on the mesepimeron and another wider on the metepimeron, between which there is a small upper spot on the black between the two yellow stripes. Tergum spotted with yellow.

Legs black, armature as for *williamsoni*.

Wings hyaline, evenly and palely enfumed ; membrane white ; stigma dark brown, over 4-5 cells, braced ; trigone of forewing with 4 cells, 3 cells long, the basal divided into 2, that of hind 3 cells long ; subtriangle on forewing traversed once, that of hind entire ; 1-2 nervures in hypertrigones ; 3 cubital nervures in forewing, 2 in the hind ; nodal index $\frac{9\text{-}18}{10\text{-}13}\Big|\frac{19\text{-}11}{12\text{-}11}$; 5 cells in anal triangle.

Abdomen black marked with yellow as follows:—segment 1 with a dorsal basal spot and a narrow apical low down on the sides, 2 with a dorsal median spot and a small lateral which involves the oreillets, 3 to 6 with dorsal spots confluent over the dorsal carina except at the extreme apex of spots, 7 with nearly the basal half yellow, 8 with a small basal lateral spot and a smaller still on segment 9, 10, with a median dorsal spot (this in the Burmah specimen covers the basal half of the dorsum).

Anal appendages. Superior considerably longer than segment 10, compressed of about even width to the apex which is squarish, separated in entire length but converging at the apices, inferior much shorter, a little sinuous and directed up as seen in profile, deeply cleft, the branches widely divaricate and triangular seen from beneath.

Genitalia black tipped with yellow, similar to *williamsoni.*

Hab. A single male from Trong, Lower Siam, the type in U.S.N. Museum. I possess a specimen from Burmah which answers to the above description, the slight variations between it and Mr. Williamson's description being probably due to changes in decomposition. The ground colour in the type is dark brown but I notice that the jet black of most species of *Ictinus* is apt to turn brown where no care is taken to prevent decomposition changes and I surmise that the type was in life deep black. The entire absence of the humeral stripe separates it from *kodaguensis,* whilst the lateral upper yellow spot on the median lateral black and the presence of a black basal spot on the upper surface of frons found in *abbotti* will serve to separate it from this insect.

Series, GOMPHUS Williamson.

This series contains a somewhat miscellaneous group of genera and species, the position of many of which is at present doubtful. *Gomphus sens strict* and *Onychogomphus* will need further splitting up, a greater knowledge of their larvæ may facilitate this as is well demonstrated by that of *Onychogomphus nilgiriensis.*

The whole series is characterized by the following characters:—All trigones, hypertrigones and subtrigones entire; transverse nervures between *Mi-iii* and *Miv* greatly reduced in number, usually only 1 in the hindwing and 1 to 2 in the forewing; sectors of arc very distinctly separated at and beyond their origin from the arc; stigma variable; no accessory sectors to *Rs* and *Miv.*

As Dr. Laidlaw points out, clear-cut venational characters are not to be found for the series as a whole owing to the large number of doubtful species included in the series. Specialization of transverse nervures between *Mi-iii* and *Miv* is much more constant in the hindwing although in some genera it is about equal in fore and hind.

Genus—HETEROGOMPHUS, Selys.

Heterogomphus. Selys. Bull. Acad. Belg. xxi (2) p. 27 (1854); Mon. Gomph. p. 94 (1857.)

Moderately or very large insects with hindwing 40 mm. or more, abdomen usually considerably longer than this; at least 16 antenodal nervures in forewing, not more than 2 transverse nervures in the forewing between *Mi-iii* and *Miv,* never more than 1 in the hind. Wings long and narrow, extending to end of segment 8 in the male, to end of 9 in the female or in one species actually longer than the abdomen, base of wing in the male strongly excavate, anal angle prominent.

Head very massive, face deep, eyes tumid posteriorly, occiput low straight in the male, often spined in the female. Thorax robust, black marked with greenish yellow or yellow marked sparingly with black. Abdomen similarly coloured, tumid at base, rather narrow and cylindrical as far as segment 7, 8 and 9 slightly dilated, the 3 last segments diminishing successively in length.

Legs robust but short, spines variable.

Anal appendages long and tapering, as long as the two last segments of abdomen, of nearly equal length, superior simple, inferior deeply cleft, its branches equally divaricate as superior appendages, bearing a robust internal spine at the apices of branches.

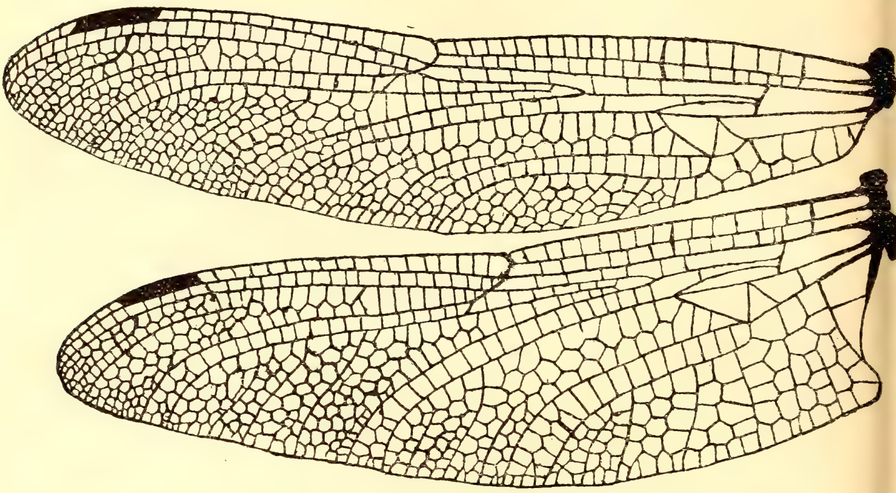

Fig. 4. Wings of *Heterogomphus hannyngtoni*, sp. nov. ♂

Genitalia; lamina bonnet-shaped, a little raised, internal hamules robust straight hooks, the external thin, tongue-like processes projecting perpendicularly from the genital sac, lobe markedly projecting, with a long constricted neck, the end expanding laterally, the expansions curling inwards. Vulvar scale small, strongly cleft.

Hab. Breeding in mountain streams. Habits closely resembling those of *Ictinus* for which the insects may be mistaken when on the wing or resting. India, Western Ghats, Himalayas, Bengal, Ceylon, China and Cochin China.

Heterogomphus hannyngtoni, sp. nov.

Male. Abdomen (with anal appendages) 58mm. Hindwing 48mm.

Head very large and massive, triangular. Eyes bottle green; labium chrome yellow; labrum bright greenish yellow margined narrowly with black; face black, the lower epistome citron yellow and a spot of apple green on either side against the eyes; frons apple green above and in front with two small points of black in the sulcus just in front of the vesicle; vertex and occiput black, the hinder border of latter raised and scale-like with a small rounded tubercle on the superior surface, fringed with long black hairs.

Prothorax black marked with a postero-lateral spot of yellow and two small spots on middorsum.

Thorax black marked with bright greenish yellow. In some specimens the markings are bright citron yellow above changing to bright apple green below. Markings as follows:—the outer angles of the alar sinus a broad subtriangular oblique dorsal stripe more or less separated from a mesothoracic collar which

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Heterogomphus hannyngtoni, and *flavicolor* were not included in the key to the *Gomphinae* as they were unknown at the time it was written.

may be either entire or interrupted. (In one specimen the separation between these two markings is bright reddish brown.) A rudimentary humeral stripe represented by a small upper spot, laterally two broad apple green stripes separated by a broad black band, the upper part of which bears a small yellow spot. The posterior stripe covering the whole of metepimeron.

Legs short and robust, black, the coxæ and trochanters of the first pair yellow. Hind femora with two rows of short robust closely set black spines.

Abdomen black marked with bright citron yellow as follows:—segment 1 with a small apical dorsal triangle and the whole of the sides low down, 2 with a dorsal stripe, broad at the base and tapering to but not reaching the apex, laterally a broad stripe, broadest at the base and including the oreillet, interrupted just after the latter structure, lastly a narrow stripe bordering the genitalia, 3 with a trilobed dorsal stripe and a lateral wedge-shaped spot at the base, segments 4 and 5 with a chain of three dorsal spots, the apical one cordate and larger than the two basal, 6 with a single basal dorsal spot, 7 with rather more than the basal half yellow, the margins of the yellow concave laterally, segments 8 and 9 with small lateral basal triangular spots, 10 entirely black.

Anal appendages black. The superior long and tapering, the inferior but little shorter and armed with a small inner apical spine.

Genitalia : lamina scuttle-shaped, its sides straight and at right angles to the dorsum ; internal hamules projecting from under shade of lamina, long curving robust hooks ; external hamules narrow triangular plates projecting perpendicularly from the genital orifice ; lobe with a broad black base, narrowing to a truncate neck which projects markedly from the genital sac, bifurcates at its apex, the bifurcations curling inwards.

Wings hyaline, long and rather broad, reticulation close ; stigma long blackish brown, braced ; *Mia* very indistinct, only 2 rows of cells between it and *Mi*. In females *Mia* is always quite distinct and there are always 3 rows of cells between it and *Mi*, this applying to all species. Only 1 cross nervure between *Miv* and *Mi-iii* in all wings.

Nodal index $\dfrac{13\text{-}19 \mid 19\text{-}15}{14\text{-}14 \mid 14\text{-}14}$.

Female. Abdomen 56 mm. Hindwing 55 mm.

Very similar to the male but the ratio of wing length to that of abdomen strikingly different. The wings enormously lengthened and broadened, evidently for carrying the extra weight of the very robust thorax and abdomen. Apart from the abdomen which is slightly shorter, the female is a much more robust and bulkier insect than the male.

Labrum bright citron yellow instead of apple green ; frons with a semicircle of black at the base of upper surface ; occiput flat with a robust spine at either end against the eyes.

Lateral spot of prothorax much larger than in the male.

Metepimeron citron yellow with a blush of green at its centre ; markings of abdomen much broader and more crowded, the dorsal marking on segment 2 being trilobed, its basal part square, the median large and broadly oval, whilst the apical lobe is small and round, the lateral stripe on this segment is unbroken at its middle, the dorsal marking on segment 3 partially constricted to form four lobes, whilst laterally a broad stripe runs its entire length, broken slightly at the transverse suture, segments 4 and 5 have an additional lateral basal spot, whilst 6 has this spot and another still larger following it, segment 9 has a minute lateral basal spot.

Anal appendages very small, conical, tapering black.

Vulvar scale very small, deeply cleft, the apices of the two lobes thus formed curling strongly inward towards each other.

Wings hyaline, nodal index similar to that of male.

Hab. Haunting the banks of jungle mountain streams, perching on twigs or more rarely settling on rocks. The male when settled bears a strong resemblance to *Ictinus* but may be recognised by its abdomen, which is held stiffly and straight outward instead of curved, scimitarlike as in *Ictinus.* Like the latter insect, it rests with the head lowermost, the body inclined upwards. When disturbed, it plunges downwards as it takes flight. It travels long distances up and down stream but makes long rests and if followed up, is soon met with again.

The only female taken was in the act of ovipositing beneath the dark shade of a tree overhanging the stream at a point where the current was very swift and racing over a bed of pebbles. It was performing a series of figure-of-eight evolutions, striking the surface of the water at the waist of each figure-of-eight. This and the first males were taken on the Cauvery near Bhagamandala (where the river rises), two subsequent males being taken at Hallery near Mercara on a mountain stream which empties lower down into the Hatty river, a large tributary of the Cauvery. The streams here are not more than ten feet across and I have never seen the insect on the main river where it becomes much wider. Type in British Museum.

In May 1906 the late Mr. Hannyngton, I.C.S., who was then Commissioner of Coorg, discovered a huge exuvia of some unknown dragonfly which he presented to the Pusa Museum. No notes are available as to where he discovered this exuvia in Coorg but from local hearsay evidence I should think it was found on the banks of the Hallery stream. Mr. Hannyngton was a keen lepidopterist and spent much of his spare time collecting in the Hallery valley. The insect is named in dedication to his memory, as there can be no doubt but that it and Mr. Hannyngton's exuvia are conspecific. (Exuvia described in M.S. Pusa Memoirs).

Heterogomphus ceylonicus, Laid., l.c.p. 412 (1922).

Described from a single male in the British Museum collected by Colonel Yerbury, Ceylon.

Male : Abdomen with anal appendages 47·5 mm. Hindwing 41 mm.

Head. Eyes probably bottle green during life ; labium yellowish brown; labrum yellow bordered with black all round and with a median prolongation of black from the base in the middle line, lateral lobes yellow ; anteclypeus yellow, postclypeus black with a lateral spot on either side against the eyes ; frons black in front, the crest and upper surface yellow, the base narrowly black vertex black ; occiput with a median yellow spot.

Prothorax black with a large lateral yellow spot and a smaller geminate spot of the same colour on the middorsum.

Thorax black marked with greenish yellow as follows :—a mesothoracic collar narrowly interrupted in the middle line, a broad oblique oval dorsal stripe not meeting the mesothoracic collar, a small spot of yellow above and to the outer side of the dorsal stripe representing a vestigial humeral stripe. Laterally broadly yellow with a broad median black stripe, the yellow being continued over the tergum.

Legs black, coxæ and the extensor surfaces of femora obliquely yellow.

Abdomen black marked with yellow as follows :—Segment 1 with a transverse basal stripe and a broad lateral stripe which is continuous with a similar stripe on segment 2, the latter segment has also a trilobed dosral band broadest at the middle, segments 3 to 6 have a dorsal stripe tapering from base to apex and gradually diminishing in length as traced from segment to segment, 7 has the basal half yellow and 8 and 9 have lateral basal streaks, larger on segment 9 than 8, segment 10 entirely black.

Anal appendages black, long and tapering, the inferior not much shorter than the superior and carrying on its inner border, near the apex a robust spine.

Wings hyaline ; stigna long, black. Nodal index 12-18-17-14.

Hab. Ceylon. The species is distinguished from the former by its smaller size, by the yellow occiput and by the yellow markings on the legs. A note penned to my sketch (made of this insect in the British Museum) states that it looks very like an *Ictinus*, a resemblance which has also struck Dr. Laidlaw. Type in British Museum.

Heterogomphus smithi Selys. Bull. Acad. Belg. xxi, (2) p. 29 (1854) ; (2) xxxvi, p. 495 (1873) ; Mon. Gomph. p. 97 (1857) ; Will., l.c.p. 315 (1908) ; Laid l.c.p. 412 (1922) ; Kirby, Cat. Odon. p. 57 (1890).

Male : Abdomen 58 mm. Hindwing 50 mm.

Head. Eyes bottle green ; labium brownish black ; mandibles yellow at the base ; labrum yellow broadly bordered with black in front, narrowly at base, the latter black sending a median prolongation into the yellow which nearly cuts it into two ; anteclypeus yellow, postclypeus black with a small median yellow spot and a large lateral against the eyes; frons yellow traversed by a fine black stripe below confluent with the black on postclypeus, above yellow with a black basal stripe slightly prolonged forward in the sulcus, rest of upper surface of head black including the back of eyes. Occiput flat, slightly tumid at middle, fringed with short black hair.

Prothorax black, posterior lobe with a median yellow spot.

Thorax black marked with yellow as follows:—a complete mesothoracic collar which may however be slightly interrupted on the crest, dorsal oblique stripes which may or may not meet the mesothoracic collar (not meeting it in the type) no humeral stripe, laterally two broad stripes which are continued over the dorsum of thorax and connect up with those from the other side, the first stripe between the humeral and first lateral suture, the second covering the greater part of metepimeron. Legs black short robust, the hind with an outer orange stripe, armed with short robust spines. Trochanters yellow.

Wings hyaline a little enfumed at the bases, reticulation black, costa slightly pale outwardly ; stigma black, 5 mm. over 7 cells ; membrane pale, narrow but extending as far as the anal angle; trigones of forewing followed by 3 cells, then rows of 2 ; nodal index

$$\frac{14\text{-}17 \mid 20\text{-}14}{14\text{-}14 \mid 14\text{-}14}.$$

Abdomen tumid at base, 8 and 9 slightly dilated, narrow and cylindrical between, black marked with yellow as follows :—segment 1 with an apical triangle of yellow and the sides broadly, 2 with a basal ring which extends apicalward along the dorsal carina and finally expands into a fleur-de-lys, the apex of which does not quite reach the apex of segment, laterally a triangular spot and the ventral border, 3 to 7 dark yellow above and on the sides, the apices broadly and diffusely blackish, the transverse sutures on these segments finely black, 8 has the base yellowish or bears two large yellow spots separated by the dorsal crest and there are rounded spots on the sides behind the transverse suture, 9 has a basal lateral vestigial yellow spot, 10 is unmarked.

The dorsal carina ends in an apical spine on segments 8 and 9.

Anal appendages blackish brown, finely hairy, superior as long as segments 9 and 10, divaricate, nearly straight as seen from above, a little curved as seen in profile, thick at base, tapering to the apex which is blunt and provided with 3-4 minute teeth below. A keel runs the length of appendage beginning at the side and ending on the dorsum at apex. Inferior appendage but little shorter than superiors, cleft nearly to the base, the branches thus formed ending in a point and an inner robust spine.

Hab. Sylhet. Type in British Museum. I have seen a single male from Mr. C. M. Inglis which I believe was taken in Sikhim, and which does not differ from the British Museum specimen.

Heterogomphus flavicolor sp. nov.

A single female collected by Mr. Mackenzie in Bihar.

Female. Abdomen 60 mm. Hindwing 51 mm.

Head, thorax and abdomen uniformly bright ochreous marked sparingly with black as follows :—Back of upper part of eyes glossy black, prothorax blackish, thorax with a dorsal stripe running parallel and close to the middorsal suture, tapering above where it extends to the alar sinus, clubbed below and not reaching the anterior border of thorax, a humeral stripe tapering below, broadening and bifurcating above to enclose a spot of the ground colour. Laterally a fine black line on the posterior suture. The humeral and lateral markings are connected to their fellows over the tergum.

Abdomen with a narrow ring at the base of segment 1 and broad, rather diffuse apical rings of black on segments 2 to 9. These rings extend slightly basalwards on the dorsal carina of each segment.

Legs short and robust, entirely yellow save for some black spines. The hind femora with two rows of short black evenly and widely spaced spines which converge at the base of femur to form a field of short stout spines.

Vulver scale very small, deeply cleft into two small triangular plaques.

Wings hyaline, costa bright yellow ; stigma long and blackish, braced ; only 1 nervure in all wings between *Miv* and *Mi-iii* ; 5 to 6 rows of cells in anal field ; nodal index 10-19 | 19-11 ; discoidal field very irregular at the beginning,
12-15 | 15-11
begins with 3 cells and continues as rows of 2 or 3 cells with no regularity ; 3 rows of cells between *Mi* and *Mia.*

I am indebted to Mr. Bainbrigge Fletcher for the opportunity of examining this splendid insect which I consider to be one of the most striking of Indian dragonflies. Its unusual colouring, scanty markings, absence of a mesothoracic collar all help to distinguish it from any other species of the genus. *H. unicolor,* Martin, from Tonkin most nearly approaches it. It is unfortunate that no data is to be added as to the exact locality where this insect was taken but as it was found amongst a collection of insects made in Bihar, the presumption is that it was taken in that province. It is to be added that the insect is of extraordinary massive build and the wings of great width and breadth. Type in the Pusa collection.

Heterogomphus risi. (Fras.)

Gomphus rasi Fras., Memoirs of Pusa, pp. 73-74(1920).

Female (male unknown). Abdomen 49 mm. Hindwing 42 mm.

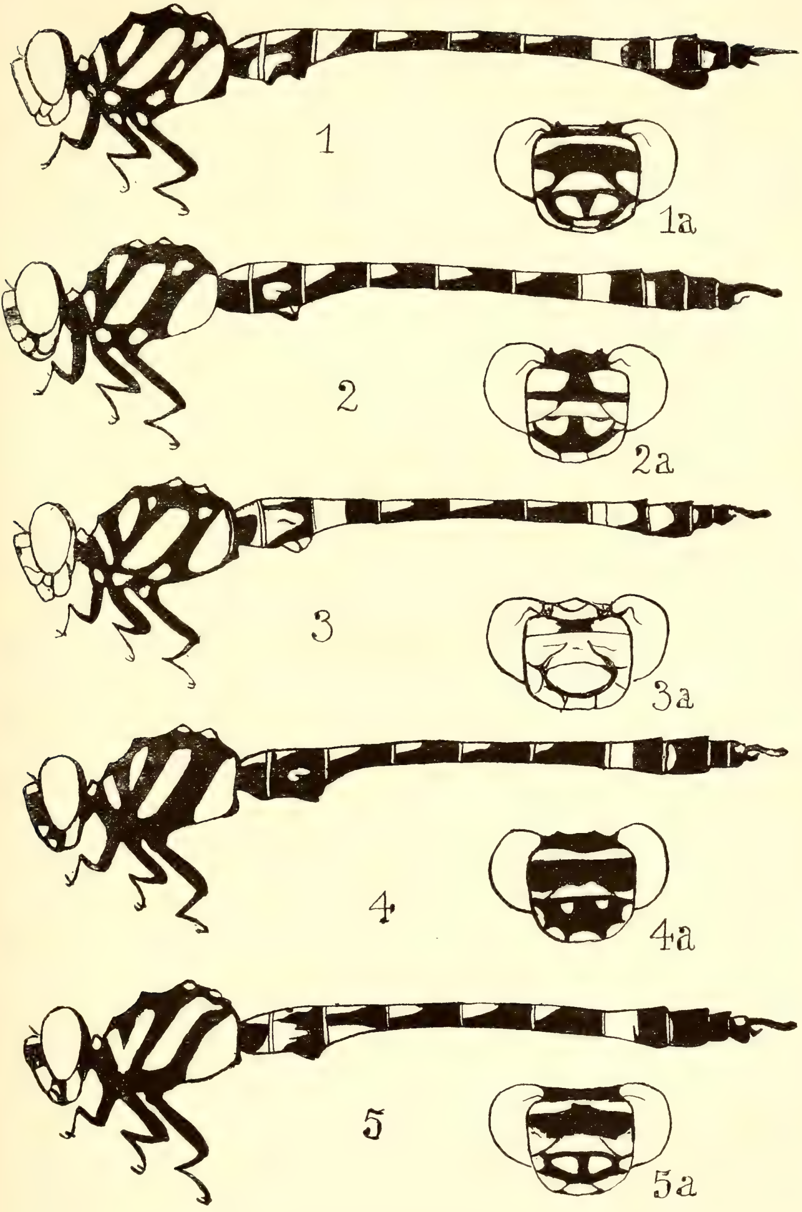
Head. Labium yellow; labrum black marked with two yellow spots at the outer angles, labial palps of the same colour ; anteclypeus finely yellow, postclypeus black with a small spot of yellow on each side against the eyes ; frons black with the crest yellow ; occiput black, armed with two small spines at the middle of its posterior border.

Prothorax black with two small spots of yellow on the middle lobe.

Thorax black marked with yellow as follows :—a mesothoracic collar unbroken in the middle line, a fine line on the midthoracic carina, narrow antehumeral stripes which do not meet the mesothoracic collar, a small humeral spot at the upper part of shoulder, the whole of the sides broadly yellow with a broad median black stripe marked by a single upper and two lower spots of yellow.

Legs black short, flexor surfaces of femora yellow.

Wings hyaline; stigma black braced, very long; only 2 transverse nervures between *Miv* and *Mi-iii* in the forewing, 1 in the hind; nodal index 14-20 | 18-12 ; 3 rows of cells between *Mi* and *Mia* at outer end of stigma ; 2
12-12 | 13-11
rows of cells between *Mi* and *Mii* beginning nearest the stigma.


1
1a
2
2a
3
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5
5a

INDIAN DRAGONFLIES.

For explanation see end of article.

Abdomen black marked with yellow as follows:—segment 1 with a dorsal spot extending the full length of segment and a large spot laterally, segment 2 similarly marked, the dorsal spot tapering apically, 3 to 6 with triangular basal spots extending for about one-fourth the length of segments, finely separated by the black of dorsal carina, 7 with the whole of the basal half yellow, the black encroaching on it middorsally, segments 8 to 10 entirely black.

Anal appendages small pointed conical black.

Since I described this insect as a *Gomphus* in the Memoirs of Pusa, I have received a second female and an examination of the wings of this specimen and a re-examination of a photo of the wings of the type specimen (now in the Pusa collection) has convinced me that it is an undoubted *Heterogomphus.* The incomplete medial lateral stripe of yellow on the thorax will serve to distinguish it from other Indian species of the genus.

Hab. Near Mangpu, Darjeeling District, 3,400 ft. The single female collected by Mr. C.M. Inglis, 31. viii. 1920. Type in Pusa Museum.

Heterogomphus bicornutus (Fras.)

Gomphus bicornutus Fras., Memoirs of Pusa, Vol. vii, p. 72 (1922).

Female. (male unknown.) Abdomen 47 mm. Hindwing 40 mm.

Head Labium black; labrum black with two transversely oval basal spots of yellow; anteclypeus yellow, postclypeus black; frons black, its crest bright yellow; occiput black furnished with two long robust medial spines on its posterior border projecting somewhat backward.

Prothorax black marked with dorsal and lateral spots.

Thorax black marked with bright yellow as follows:—An antehumeral oblique stripe joined to a slightly incomplete mesothoracic collar so as to form inverted "7" s. A vestige of a humeral band represented by a small upper spot. Laterally yellow marked with a very broad medial black band which bears an upper and lower small spot. Tergum spotted with yellow.

Legs short and stout, finely spined, black, the trochanters yellow.

Abdomen black marked with bright yellow as follows:—Segment 1 with a large lateral spot and a smaller dorsal spot on the apical border, 2 almost entirely yellow with a fine black apical mark on the dorsum which extends a short distance along the dorsal carina, segment 3 with nearly the basal half yellow on the dorsum, rather less than this on the sides, 4 to 6 with small basal semi-lunar spots just meeting over the middorsum, 7 with rather more than the basal half yellow, 8 to 10 black.

Anal appendages black, conical, short.

Wings saffronated at the base as far out as the trigones and for rather more than this in the subcostal space; stigma black braced rather short; 2 rows of cells between *Mi* and *Mii* beginning nearer the node than stigma; 3 rows of cells between *Mi* and *Mia* at level of distal end of stigma; 2 transverse nervures between *Miv* and *Mi-iii* in the forewing, 1 in the hind; nodal index
14-18 | 18-15
———
15-14 | 14-16

Hab. Shillong, a single female collected by Mr. Bainbrigge Fletcher, 18. vi-1920, taken hovering over a stream, evidently ovipositing.

A further examination of the venation of this insect has convinced me that it is an undoubted *Heterogomphus* and not a *Gomphus* as I had first described it. It may be distinguished by the fusing of the mesothoracic collar and dorsal oblique bands to form inverted "7"s and also by the robust occipital spines. It bears a superficial resemblance to the last described species. Type in Pusa Museum.

Explanation of Plate I.

1. Markings of *Ictinus rapax*, ♂
1a. Markings of head of same, facial view.
2. Markings of *Gomphidia fletcheri*, ♂
2a. Markings of head of same, facial view.
3. Markings of *Gomphidia T-nigrum*, ♂
3a. Markings of head of same, facial view.
4. Markings of *Gomphidia abbotti*, ♂
4a. Markings of head of same, facial view.
5. Markings of *Gomphidia williamsoni*, ♂
5a. Markings of head of same, facial view.

Explanation of Plate II.

1. ♀ 1 ♂. Markings of *Heterogomphus hannyngtoni.*
1a. Markings of head of same, facial view.
2. Markings of *Heterogomphus flavicolor*, ♀
2a. Markings of head of same, facial view.
3. Markings of *Heterogomphus ceylonicus*, ♂
3a. Markings of head of same, facial view.
4. Markings of *Heterogomphus smithii*, ♂
4a. Marking of head of same, facial view.

(*To be continued.*)

THE RED ANT.

BY

MAJOR R. W. G. HINGSTON, I.M.S.

Part II.

THE GATHERING OF SUPPLIES.

(*Continued from page 372 of this volume.*)

Capture of insects—Stretching of victim—Evolution and fixity of instinct—Effect on nervous system—Experiments on stretching—Employment of poison—Transportation of capture—Attention to cattle—Acquirement of herd—Types of cattle—Summary of habits.

Now that we understand the architecture of the nest, let us turn our attention to certain other features connected with the out-door activities of this ant. We will here investigate the supply of food. This ant gains its sustenance from two main sources; one from the insects which it captures alive, and the other from the cattle which it carefully tends and establishes in its nests and byres.

They make thorough explorations in their search after insects, moving widely over the branches and descending to the ground beneath. Some kinds they seize in the midst of the foliage, others on the trunks of the trees. When the mango is in bloom they capture many on the inflorescence, but their richest field is the decaying debris which has accumulated round the base of the tree. In the winter months they are almost faced with famine, but in April and May the supplies improve. Later the rains bring them insects in abundance when a profuse and varied entomological supply is gathered into the nests and byres. They are untiring in their search after food and plunder. Winter and summer they are continuously on the prowl. There is no cessation night or day in this all-essential toil.

If I were to enumerate all the species seen captured by these ants the list would make a formidable array. It includes beetles of many kinds and sizes, such as weevils, scarabs, carabids and longicorns, and also a variety of Pentatomid bugs. Crickets and spiders are more juicy victims; even butterflies and moths seem to be taken unawares, while every kind of larva is fitted for the store. Most of these they discover round the base of the tree, but when the mango is in bloom they get quantities of ladybirds, also little gnats and other delicate diptera which are attracted to the yellow flowers. Ants of other species are amongst the commonest of captures. They will overcome even the massive soldiers of the black ant, and that vigorous ground species, the *Myrmecocystus*, forms an important part of their prey. Even the best armed hymenoptera do not always escape. Bees and solitary wasps are sometimes overwhelmed. I have seen them struggling with the yellow *Polistes* and transporting the formidable hornet to their nest. Nor do their own companions escape the ravage. When wounded or dying, they are carried to the storehouse where later they are sucked dry. The fact is that these ants devour every kind of flesh, the dead carcass of any insect or bird that they find, and almost every living thing that they are able to overwhelm and force into their nests or byres. Even pieces of fruit they will sometimes gather in as a supplement to their animal food.

It is interesting to observe their mode of capture, for most of their provender is taken alive. A worker is exploring that important hunting ground, the litter of leaves and decomposing debris that has accumulated round the foot of the tree. It is prowling about in a leisurely way, at one time surmounting a piece of withered vegetation, at another time exploring the recesses beneath. At length something attracts its notice. It has spied a beetle moving in the debris. It makes a forward movement, amounting almost to a rush and the victim is suddenly seized. The leg is usually the part that is gripped; the curved jaws of the worker are bent around it, and the deadly contest begins. No tumultuous fight ensues; there is no attempt on the part of the worker to rend or to stupefy its prey. It just takes hold wherever it can, and stubbornly maintains its grip. It will cling on, if necessary, for an hour or more, absolutely refusing to budge. The beetle fights to escape its enemy. It struggles; it drags itself away with all its might, but the ant just clings to its point of vantage, though often forced to give a little ground. Its jaws, however, are irrevocably fixed; it throws back its legs, clings to every foothold that offers; it makes no attempt to summon assistance, but relies altogether on its own determination, adhering to its victim with a fierce pugnacity until assistance happens to arrive.

At length a passer-by observes the struggle. It immediately determines to enter the contest, grips the beetle in some other situation and joins in the stubborn hold. Other workers soon arrive; the reinforcements come in from different directions; from a distance they detect the augmenting battle and hasten to lend their aid. The beetle is seized on opposite sides; its enemies crowd all round about it and envelop it in a deadly ring. Its last possibility of escape has vanished; it is at the mercy of the tenacious swarm.

How varied are the tactics associated with capture as employed by the different species of ants. The actual seizure is simple enough; this is always a fierce grip with the mandibles and a clinging with tarsi and claws. It is the subsequent machinery of final subjection that marks the distinctive strategy of each. Simplest of all is that of the *Myrmecocystus*; it just falls on its victim and takes its hold; no further ruse or assistance is required since all can be done by its individual strength. The Indian black ant also relies on its own efforts, unless it finds itself unequal to the task, when it will immediately hurry back to the formicary to call forth a rescuing troop. The *Phidole* has elaborately improved on this behaviour, for, on all occasions, the discoverer dashes to the nest and despatches, not a small and compact body, but a bustling multitudinal swarm. The little *Prenolepis* relies on its agility and speed; after examining its victim, it rushes about, communicating with every individual it meets until an army comes pouring on the scene. The red ant differs widely from all these. Its method is that of the patient bulldog; it merely clings to its capture with an indomitable grip, trusting that the struggle will attract attention and quickly bring others of the commune to its aid.

The prey is overcome by force of numbers and by the fierce and relentless determination of each ant. But now comes the most interesting part of the process, a special and peculiar feature prominently displayed by this species of ant. The issue of the contest is clearly over. The prey is overwhelmed and besieged by enemies and is now awaiting transportation to the nest. But this is not always a very simple matter. The ants have before them a difficult journey. Their nest is far above them in the highest leaves. They must first convey their burden through the litter of debris, then hoist it up the perpendicular trunk, then carry it out along the radiating branches before they finally reach their goal. They can scarcely face this journey with a struggling capture, one that resists at every step and fights every inch of the way. Their victim is still vigorous and strong. It is certainly powerless, being firmly held on every side; but the ants have done nothing to seriously injure it, and on the slightest relaxation it will endeavour to escape. It must, therefore, first be rendered powerless before it can be carried to the nest.

Other ants, in order to effect this, would probably employ their poison and stings. But such is not customary with this particular species; it has a special and remarkable method of its own by which to reduce the struggles of its prey. It proceeds literally to stretch its capture, as it were to extend it on a gibbet, and strain on it until its life is gone. The ants gather round it in a dogged ring. They seize on every projecting point, but it is mainly on the slender legs and the antennæ that they exert the deadly strain. Two or three may secure themselves to one leg, one holding it near the tip of the tarsus, the others higher up on the shank. The antennæ are hauled away in front, the legs are drawn out on either side, with the result that the beetle is widely extended and stretched to the utmost of their power. The ants spread themselves outward from it; they are like the spokes that radiate from the centre of a wheel. They lie with their bodies fully stretched, and their middle and hind legs thrust out behind them so as to cling to the gripping points. All pull together; all pull in different directions; each exerts its utmost energy in the steady and persistent strain. They are unrelenting in the fierce tenacity of their grip. I crush the thorax of one, I cut off the abdomen of another, but still they maintain their hold. I separate the head by an amputation through the neck, but the jaws still continue closely clenched and firmly fixed in the prey.

This is certainly a most efficient machinery. The victim, when thus stretched, is utterly helpless. We may still observe the pulsations of its belly, but it cannot make the slightest movements of its limbs, so closely and tenaciously are they secured. The method is always adopted by the ants. It is their one great means of controlling movement, as the following interference will show. I find a group of them transporting a dead insect up a tree. I take the capture between the blades of a forceps, agitate it gently so as to make it seem alive. Immediately the workers gather themselves around it; they abandon the business of transportation, extend themselves at full length from the dead capture, and begin to stretch it with their usual tenacity as though it had recovered and come again to life.

The number that engage in this machinery of extension depends on the size of the victim to be stretched. Eight are sufficient to extend a comrade, or more commonly an intruder of their own species which has happened to invade their tree. One will take it by the points of its jaws, a second by the tip of its abdomen, and three on either side will operate individually on its legs. This is, therefore, the normal complement for an insect of their own size. As many as possible often join in the performance. Half a dozen may combine to subdue a weevil scarcely a quarter of an inch in length. There may be twenty employed in the stretching of a ladybird, the victim appearing like a crimson hub encircled by the straining spokes. Even soft-bodied captures are similarly dealt with. The ants pull at opposite ends of a caterpillar, stretch it out to its full extent. until strained almost to the breaking point. I saw an army of them assembled round a young bird. Literally hundreds had massed themselves about it; they had even piled themselves one upon the other in order that a greater number might come in. Every available point was gripped. Scores of them clung to the head and tail, and the legs and wings were so tighly stretched that the bird was spread-eagled on the branch. It was utterly helpless in so violent a grip; indeed its life could not have lasted many minutes under so continuous and fierce a strain. On the following evening it had disappeared. The ants must have had eviscerated and destroyed it piecemeal, since all I could find was its distended stomach around which was assembled a party of workers endeavouring to drag it through the gateway of their nest. Thus the ants can, by virtue of their numbers and organization, overcome a victim vastly larger than themselves, and they must be reckoned as a formidable enemy of birds, though probably less in destroying the young than by preventing the nests from being built on the tree.

The insects which they stretch are never just paralysed. I have often taken them from the ants when the operation was complete. They never showed any sign of recovery, for the ants do not loosen their murderous grip until the victim is strained to death. Let us look with more detail into the sequence of these changes which produce so destructive a result. We will test them first with one of their workers, since it equals them in size and strength. I give them a red ant from a neighbouring nest. Being a stranger, it is instantly seized and placed on the deadly rack. I interfere with the operation after the lapse of a minute and remove the victim from the murderous vice. It shows indications of partial paralysis ; it drags those legs that had endured the strain. Though it still can stumble and put up a fight, yet its strength is clearly failing and its limbs have lost their power. I examine another after a space of two minutes. Its vitality is further impaired ; it can no longer walk, though it still has some vigour ; it can make an incoherent attempt to struggle and can wave its enfeebled limbs. After an interval of five minutes I remove a third. It is utterly helpless, almost devitalized, and completely at the mercy of the ants. I can detect a gentle tremor of its antennæ and an occasional movement of one of its legs. Otherwise its incapacity is total ; its body, as a consequence of the stretching process, is paralysed in every part.

Let us pass to a larger and more powerful victim. I test the operation with the *Gymnopleurus miliaris,* a medium sized beetle of the dung-rolling type. It is stout in appearance and massively built, since strength is a necessary attribute to an insect which is in the habit of rolling a load. The ants crowd around it in a dense array. Twenty to thirty of them join in the siege and pack themselves into a dense ring. I examine the beetle at successive intervals. After two minutes it is still vigorous ; it can walk and fly almost as energetically as before, though the hind legs seem to have lost some of their power. After two more minutes there is little further change ; if the ants allowed their hold to slacken the beetle could still easily escape. Five more minutes shows decided progress. The muscular power is now distinctly impaired. It can manage now just to stagger with difficulty, being apparently unable to flex its legs which stick out as though they were permanently stretched. Another five minutes completes the operation. The beetle is now paralysed and helpless and ready to be carted away.

In this instance the beetle seems to have rapidly succumbed, possibly as a consequence of the number of workers which happened to take part in the act. Other beetles of the same species were still vigorous after an equal time. Some could stagger after twenty-five minutes, while others were completely subdued. Thus the length of the operation is very variable, though the end is always the same.

The particular structure of the red ant's mandibles must not be passed over without a word of note. For they are well fitted to this wonderful machinery, and they indicate the efficiency with which Nature adapts a structure to different ends. There are two distinct patterns of jaw commonly observed in worker ants. One is the stout, triangular mandible, a strong and powerful weapon, armed with blunt teeth. Such is the particular organ of the *Camponotus ;* it is excellently fitted for the rough toil of labour, to break down the soil, to evacuate the earth, to hoist heavy burdens along to the nest. The other type is possessed by an ant like the *Polyergus ;* it is a curved and pointed spear, slender, sharp, unprovided with teeth, serving its owner as a deadly lance for the penetration of the victim's brain. Now the jaw of the *Œcophylla** is intermediate between these two, obviously because the ants require it for a somewhat intermediate type of work. It is not a rough instrument with which to hew and delve since these workers live an arboreal life and construct their nests amidst the leaves. Nor is it purely a pointed spear, for these ants do not strike at the brain of their capture but kill them by a continuous stretch. Hence they are supplied with intermediate weapons. The base of the jaw is their instrument of labour ; it is shaped in the form of a stout triangle, armed and toothed and strong. They require it for the purpose of hauling on the leaves and for transporting provender to their nests and byres. The apex of the organ is their instrument of battle. It is a slender curved and pointed spear, perfectly fitted for clinging to a capture, and serves, as I have shown, as a prehensile sickle to support the larva when carried about. Thus

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* *Vide* figure in Part I of this article on page 363 of this volume.—Eds.

Nature has supplied the necessary weapons for both capturing and overcoming the prey. The chief implements of seizure are the pointed hooks; the stout bases take the steady strain.

Though this instinct of stretching a victim to death is a most elaborate and efficacious act, yet it must have originated in some simple operation before it had reached this highly finished state. Let us look for instruction to the *Prenolepis* ants. They effect a capture by rapid communication; and, though they quickly overwhelm their victim, yet they do not apply the deadly stretch. But they besiege it, they cling to it, they haul out its legs and antennæ until sufficient reinforcements have arrived. In this way they drag on it and hold it down, and in a mild and incomplete degree, give it a partial strain. They have, as it were, adopted the first stages of the mechanism. This is the operation in its rudimentary state. What it needs in order to reach the perfection of the *Œcophylla* is that the strain should be strengthened and maintained. If the *Prenolepis* improved on its holding act it might develop the deadly stretch.

This instinct of stretching is of vital importance and is peculiar to this class of ant. Under ordinary circumstances it never fails, but, as is so usual in the case of instincts, we can detect an absence of the simplest judgment when it operates out of the usual course. For remember that its importance to the ants is so great that without it they could not quell their prey. They employ it remorselessly on every occasion; the instant the capture is fixed by the jaws it is placed within the fatal vice. But sometimes I have given them a dead insect and have watched with surprise how they employ the instinct even when necessity does not demand its use. One would expect them to carry the dead insect away, for there was nothing to prevent it going straight to the nest. But the ants never attempted this. Although the insect was lifeless, yet they put it to the stretch. They spread themselves around it with the same determination as if it were a capture fighting for its life. The instinct is, therefore, a fixed natural impulse which the ants must of necessity obey. They show little evidence of choice in the matter. Whether the insect is dead or alive their first instinct is to put it to the stretch. This is a type of lesson that we frequently learn. The impulse is vital to the ordinary occasion, for the ants habitually take their prey alive; but when they meet with an unusual incident, such as the finding of an insect that is dead, still the instinctive machinery must follow though it may fulfil no useful end.

The production of the paralysis most probably results from the great tension on the system of nerves. Consider how this delicate apparatus is constructed and how it must suffer from the strain. In the head of an insect are two nervous masses. One lies above and one below the gullet and they are connected together by lateral threads, the whole forming the insect's brain. From the lower one is prolonged the nervous cord. It is a double chain, dilated at intervals into ganglionic swellings, and extending throughout the full length of the insect in the middle line beneath. A system of delicate nerves originates both from the brain and the gnglionic cord. They spring from the series of nervous dilatations. Those from the brain pass to the structures of the head, sending filaments into the antennæ and to the appendages of the mouth. Those from the cord go to the thorax and abdomen and ramify into the tissues of the limbs. A branching arrangement of nervous filaments thus extends to the integument from the central chain, all commencing from the ganglionic masses and terminating in the superficial parts. Consequently when a strain comes on the appendages, it results in a stretching of the nervous threads. Through them the tension is transmitted to the ganglia, which are, at the same time, being strained on from the opposite side. The central system is thus stretched in different directions. It is there that the delicate nerve cells are situated, and, no doubt, as a result of the steady extension, their connecting processes are drawn apart. It is the ganglia, I imagine, that most vitally suffer, and the disturbance of the function in such essential organs seems the most probable cause of the paralysis and death.

A process so mechanical should be capable of imitation. I, therefore, attempt to confirm it experimentally by the application of an artificial strain. The large *Anthia sexguttata* is chosen for the test. It is a conspicuous Carabid of a black colour and ornamented with six white spots. A rack is arranged by means of a saucer resting on the top of a jar. The saucer is placed with its under surface upwards. In its central circle will be laid the victim, and the instruments of extension, in the form of weights, will hang down all round the edge. The *Anthia* is placed on the stretching-board. Weights are attached to its antennæ and its legs, being firmly secured by threads. In this way the beetle is widely stretched, since each leg and each antennæ supports a weight of 480 grains. The strain is tremendous ; the total force of the extension apparatus is 3,840 grains, and infinitely greater than the ring of workers could ever hope to apply. I expect that paralysis will rapidly follow, since the *Anthia* is absolutely fixed and motionless and the strain is evenly applied all round.

I remove the victim after a stretch of five minutes. To my surprise there is not a trace of paralysis ; the insect appears to have suffered nothing from the rack. I conclude that the time has been insufficient ; the experiment must, therefore, be resumed. During the next two hours I examine it at intervals. But it never shows a sign of any paralysis, and at the end of that period it seems as vigorous as when the experiment began.

This was certainly a surprising result. It seemed so clear that the machinery of the ants was merely a mechanical strain. Perhaps I had applied the extension threads at too high a level on the limbs. The ants usually grip them by the tips of the tarsi : I had affixed the extensions to the shanks. The experiment must be repeated under modified conditions. A load of 2,880 grains is now applied ; it is uniformly distributed in the same way as before, but the threads are now attached to the ends of the tarsi just above the terminal claws. The beetle is left for five hours on the stretching-board, yet, when released, it shows not a sign of weakness, but runs energetically away.

Why this failure ? I do not hope to imitate the efficiency of the *Œcophylla*, but why this complete and utter deficiency in comparison with the perfect machinery of the ants ? It seems clear that they must possess some further provision for dealing with their larger and more powerful prey. The physical stretch is sufficient for the smaller victims but in order to subdue a hard-cased beetle they must use more than mere mechanical force. Let us, therefore, observe them with greater care. We will leave for a time these unnatural experiments. Though they have clearly disclosed our error, yet they have failed to show us truth. We will turn again to the leaves and branches, placing more trust in the natural haunts. We have often profited by the well-learnt lesson that

> " Art may err, but Nature cannot miss."

I, therefore, resume the observations in the grove, and am determined to watch with infinite care. I give the ants an *Anthia* such as I had dealt with on the rack ; but they are unable to hold the monster, and, though I secured it till many had collected, yet it tore itself from their stubborn grasp. I then observe them overcome a *Gymnopleurus* which, as I have already said, is a powerful beetle, and is clothed in a rigid mail. At first I see nothing but the stubborn stretch. Such is sufficient in the early stages when they certainly applied no other aid. But later in the conflict I notice a change. Some of the ants begin to investigate their victim while others maintain the stretch. The investigators examine it on every side, touching it attentively in different parts and apparently testing it by the pressure of their jaws. They bite gently at its limbs and at the edges of its shards as though they were trying to learn the details of what had chanced to fall into their grasp. Then, occasionally, I see one of them flex its abdomen, turn in the point of it towards the beetle, and apply it in so careful and deliberate a manner that it seemed to select the particular spot. Sometimes too I am able to detect that from the tip of the abdomen there is suddenly shot forth a spurt of watery juice. Other ants repeat this same operation, and it soon became evident that a process of poisoning was an additional weapon employed to reinforce the stretching of the prey. More attentive observation then disclosed the fact that the ants very carefully selected those points at which to apply their poisonous juice. It would have been a waste of their precious fluid if they had turned it thoughtlessly on all parts of their prey. For this dung-beetle is protected in a rigid integument; the greater part of its body is secured in armour on which the poison would have no effect. But the ants are frugal of their potent fluid. They carefully seek out the joints in the harness ; for this reason they feel it all over with their jaws seeking out the soft and assailable points. They specially attack the articulations of the body since these are the supple membranous connections that unite the armoured plates. They shoot their juice into the cleft between the head and thorax, into the line of junction between the thorax and abdomen, and into the many articulations of the limbs. They haul forward the shovel-shaped head and insert the tips of their abdomens beneath. In this way they reach the tender parts around the mouth, and in the same way they apply their jets of poison to the points of weakness at the posterior end.

This explains the failure of my mechanical experiments. No doubt the strain is sufficient for the smaller victims, especially those with a soft integument which will easily yield to the force of the stretch. But for these powerful, hard and well-protected beetles some additional device is required by the ants. Their poison percolates through the points of weakness ; it, no doubt, soaks in through the connections of the thorax and the soft tissues at the joints of the limbs. There it reaches the nervous filaments where it adds its chemical or corrosive effects to the paralysis brought about by the strain. The whole procedure is thus an excellent example of combination. Not only do the workers unite their labour so as to uniformly strain on the helpless prey, but, by their efforts, they open the joints of the victim, and prepare it for the reception of the poisonous fluid which the other workers so carefully apply.

I now leave the machinery for subduing the victim and pass to its manner of transportation to the nest. As soon as the insect is stretched to death the greater number of the operators retire. There is no special struggle or competition to secure it. The ants, of course, realize its value as a capture, yet none show any greediness to cling to the prize. Just sufficient remain with it for the toil of transport. They pick up their burden and commence the journey, the anger of the fight being now forgotten and all working in a harmonious group. It is often a long and laborious business. The capture may be many times their own weight and they have to hoist it from the base of the tree high up into the topmost leaves. They are enabled to do so by their admirable discretion and by that instinctive faculty of union which multiples their individual strength. Three or four are sufficient to carry a ladybird; six to eight will easily transport a *Gymnopleurus* ; the smallest captures may be taken as single loads ; the largest may need thirty or forty workers in order to shift them along. The ants are ingenious in their system of carriage. They have to hoist it up the perpendicular trunk, hence they must work in some regular way. Most of them take their station at the upperside of the burden; two or three may attach themselves below. They fix themselves tightly to every point of vantage ; with their hind tarsi they cling closely to the bark ; with their jaws they secure themselves to the body of the prey. Some take its legs, others its wings, still others lay hold of its long antennæ or any other suitably projecting points. The workers on the upper side then haul together while those below keep a gentle strain. It might seem that the latter only checked the progress, but their main object is to move with the burden and just hold it sufficiently to steady the load. The capture in this way is rapidly raised, since all toil with a common purpose and exert a uniform strain. Sometimes the progress may happen to be checked. Others in the vicinity then come to the rescue. An increasing number gathers round the capture; with their help it is hoisted over the obstruction and is again started on its course. At length, having surmounted all their difficulties, having hauled it up the trunk and out along the branches, they at last come to their leafy dwelling and drag their victim through the gate.

The capacity to exert a continuous strain is the predominant feature in the life of these ants. On this depends their exceptional powers of performing strenuous feats. We have seen how they draw the stiff leaves together before uniting them with strands of silk, how they stretch the life out of their bulky captures by straining on the antennæ and the legs, how they hoist their formidable burdens to the foliage by all hauling in a common team. The possession of this instinct is the secret of their success. Other ants achieve the same essential objects. They too overcome their victims and transport them bodily to the nest. But they have different methods for securing these ends. The *Myrmecocystus* relies on its individual strength; each of the workers is so powerfully built that it can deal itself with the contingencies of life. The *Camponotus* possesses a special caste of soldiers, and these lend a hand in the heaviest duties which the smaller workers are unable to fulfil. The *Phidole* depends on its infinite numbers, trusting in the power of the multitudinous swarm that is waiting in readiness to pour from the nest. Thus different kinds of ants possess different instincts for the fulfilment of the same ends, and one of the most interesting and essential of these is the power of the *Œcophylla* to combine their efforts in a steady unremitting strain.

So much for the rapacious habits of these ants. I come now to the second of the two great sources from which they secure supplies. If we examine the interior of a nest or byre, we will almost certainly discover a multitude of flakes strewn like coins over the surface of the leaf. These are the most valued possessions of the ants; they are coccids of the species *Lecanium hesperidum*, and give forth an abundant supply of juice on which the ants continuously feed. In appearance they are smooth and flattened flakes somewhat bigger than the head of a large pin. Superficially they appear almost devoid of structure; their backs are raised like a sloping roof, darker on the summit in the middle line and shelving all round into a paler edge. Their ventral surfaces are pressed close against the leaf where they remain in an absolutely passive state as though they were mere excrescences on the wall of the nest.

These coccids are collected in enormous flocks; on one square inch of leaf I counted 250, and it is mainly in order to protect these gatherings that the smaller habitations are built by the ants. They are the most important of the species of cattle which supply the *Œcophylla* with juice. As a rule all sizes are represented in the herd. Many are fully developed scales; but amongst them are often the smaller forms, the tiniest specks of living substance and indistinguishable without the aid of a lens. These latter are the numerous offspring of the herd. They are more active than the motionless adults and crawl energetically over the leaf. Some of them take refuge under the larger flakes like chickens beneath the body of their dam. Thus we observe a further function of the byre. It is not only a structure for the reception of the cattle; it is also a fertile and elaborate breeding-chamber, an enclosure for the generation of fresh herds to supply the particular needs of the ants. When we consider the myriads of these tiny coccids scattered everywhere over the wall we gain an impression of the remarkable efficiency with which the byre fulfils its end. Nor is it less wonderful that the coccids thrive in the interior of such a shed. Its atmosphere reeks with formic acid. As we break through the wall we smell the vapour; it issues forth as a strong and pungent fume perceptible a yard away. Yet in such an atmosphere the coccids live and abundantly generate their kind. I have sometimes noticed that the interior of the wall is covered with a superficial gloss. It looks as if it had been delicately smeared with the thinnest layer of oil. This is the inspissated juice of the coccids, drops of liquid which, escaping the voracity of the ants, have flowed over the green leaf.

The ants move freely in the midst of their herd. They pay them the usual attention and care. The ant passes from one to another stroking them each in turn. It bends down its antennnæ towards the coccid, turns in the points until they almost meet, and then applies them to the insect's back which it gently titillates and strokes. The cattle are never left to themselves; night and day they receive the same attention, and certain workers will always be found tending them in the nests and byres. They are usually stabled on every leaf, being sprinkled over the wall of the chamber, and also on the partitions that divide the interior, and sometimes on the enclosed stems. They are, however, not quartered indiscriminately. Whether it be due to the instinct of the cattle or to a special judgment on the part of the ants, at least it is obvious that the coccids are assembled on either side of and close to the midrib of the leaf. This is their specially selected stable; there they congregate in a long line while only a few stragglers remain at the edge. The site is, no doubt, chosen for purposes of nutriment. Near the midrib the leaf is thicker and more juicy, and the cattle will there find more abundant sap than if they occupied the extreme edge. The surface of the leaf is sometimes finely granulated and is coloured a blackish hue. This must be caused by the action of the cattle. It is a withering of the superficial layer of tissue resulting from the withdrawal of fluid from the leaf.

These living flakes exude their liquid in the form of minute drops. It is a slightly viscous fluid, of the consistency of syrup, clear as transparent water to the eye, and delicately pleasing to the taste. The coccids must discharge it in considerable abundance and deprive the plant of a large quantity of sap. If the ants are not present the excretion goes to waste. This is of course a very rare event, but in one byre, which seemed to have been abandoned by the commune, about half a teaspoonful of the fluid had accumulated and lay neglected on the floor of the shed. Thus the cattle first imbibe the vegetable sap, then, having drawn their nutriment from it, excrete the refuse for the benefit of the ants. There is, therefore, the closest inter-relationship between the lives of the mango, the *Lecanium* and the ant. The bug is attracted by the juicy foliage, the ant is drawn to the excretions of the bug, and the tree in all likelihood is protected from ravagers by supporting the columns of ants.

The *Œcophylla*, in addition to the excretions of its cattle, is eager for fluid of every kind. As is usual with all ants, it is fond of syrup. Hundreds will heap themselves around a spoonful of the nectar, piling themselves thickly layer upon layer in their efforts to reach the sweet supply. They will sip up water or sputum or the juices of insects, and I have seen them lick at the formic acid which one of their workers had exuded on a leaf.

As is customary amongst ants, they feed one another. Those workers which happen to discover food convey a share to those on duty in the nest. In most species the act is a quiet regurgitation, but the *Œcophylla* makes a more vigorous display. When the mouth parts of the two come into apposition, we observe an energetic vibration of the antennæ. Those of the one play vigorously on those of the other, and for a minute there is a whirl of threads.

It looks as though the ants were engaged in a contest, though it is only an exuberant manifestation of enthusiasm and a satisfaction at benefits received.

The workers which undertake the conveyance of liquid often appear in a distended state. It is not a very conspicuous dilatation, but, sometimes, when observed against a bright light, their bellies may be seen to be tense and swollen as though made of pellucid glass. They, therefore, serve the purpose of portable reservoirs, filling themselves at one place with a store of fluid and disgorging it at another place when occasion requires.

The next point to consider in this remarkable association is the manner by which the ants acquire their herds. In their daily explorations they search the foliage, carefully investigating the stems and leaves in every part of the tree. By chance they may come across a group of coccids, perhaps some twenty or thirty congregated on a shoot, which appear to be a promising herd. The workers soon set about operations. If the vegetation in the vicinity happens to be suitable, they soon construct a leafy barrier so as to closely imprison the herd. But at other times the ants may meet with the coccids in some place where the leaves are unsuitable for a byre. The herd may, for example, be on the stalk of a flower with nothing available in the vicinity for the manufacture of a leafy wall. On such occasions they will construct a chamber of silk, attaching the threads to any points or projections which happen to be suitably placed. A transparent fine-spun web results ; a byre is fashioned exclusively of silk and the herd is enclosed within its delicate walls.

It is easy to observe the eagerness of the ants in their efforts to imprison a herd. A simple experiment will disclose their methods if we do not chance to discover it in the natural way. From the interior of one nest I remove a partition to which a number of cattle are attached. I place the herd on a neighbouring tree near the workers of a different nest. The busy investigators soon come across them ; they show great enthusiasm at the rich discovery, soon begin to draw the edges of the leaves together, and at the same time despatch some of their number to fetch up larvæ for the generation of silk.

The leaves of these edifices sometimes wither, the result, I take it, of the acute flexure which the ants have brought to bear upon the stems. This causes much discomfiture to the ants. The dry leaves can no longer supply sustenance for their cattle, and, in consequence, the ants must desert their habitations and build more suitable quarters elsewhere. There is something human-like in the operations of ants. They too have to seek out fresh fields of pasture on which to graze their flocks and herds.

The method which I have described of stocking the byre is the one which, I imagine, most usually occurs. But the ants may not be satisfied with those originally imprisoned ; they will frequently add to the number of the herd by carrying others into the byre. I have often seen one transporting a *Lecanium* along a branch. It had met with the flake in its progress through the leaves, and, gripping it carefully by the edge of the disc, was conveying it to the security of the shed. When the ants have of necessity to change their quarters they transfer their cattle to the new abode. This usually results from the desiccation of the leaf or from the chamber becoming seriously torn. On such occasions I have watched them evacuating their treasures, not only their precious eggs and larvæ, but also the separate individuals of the herd.

Though their usual plan is to build a byre around their cattle, yet I think that they will sometimes construct a shed with the deliberate intention of stocking it from elsewhere. I have seen them selecting the young juicy leaves to which no insects of any kind were attached, and weaving them together in the usual way so as to fashion substantial byres. These they soon stocked with numbers of *Lecania*, brought mainly, I think, from other chambers in a different part of the tree. I have little doubt that they repeatedly construct new sheds in order to meet the requirements of their herds. For this purpose they require the soft juicy leaves and scatter their sheds all over tree. And hence we observe them so perpetually engaged in transporting their cattle from place to place.

The *Icerya* is another type of insect which the red ants maintain in the interior of their sheds. Like the *Lecanium* it renders a supply of juice and receives in return the same protection and care. It is a member of that peculiar family of bugs to which the *Lecanium* also belongs. For an insect it presents an extraordinary appearance. It is a little flattened snow-white flake, its colour being caused by a garment of fluff which is heaped in profusion all over its back. We see no head, no legs, no segments of the body; all that is apparent is the snowy coat, yet underneath this covering is a yellow scale which crawls leisurely over the leaf. Like the *Lecanium* it often fixes itself close to the midrib, guided by its instinct to that part of the foliage where it is likely to obtain the most abundant juice. But an even more specially favoured situation is round about the green stems. The ants bestow on it as much attention as they give to the cattle hitherto described. They stroke it with the same deliberation and care, and it, in response, tilts up its abdomen to supply them with liquid food. Both it and the *Lecanium* are often stabled together. The two may be confined in the one shed or may even browse off the same leaf. But each has its own specially favoured place with the result that the herds are kept somewhat apart. The *Lecanium* is usually stabled on either side of the midrib while the *Icerya* is implanted on the stem of the leaf. The *Icerya* grows with the same vigour as the *Lecanium* in spite of the fœtid atmosphere of the byre. The individuals multiply, the snowy flakes grow to a goodly size and expand into a thick and flocculent mass piled around the enclosed stems.

The red ants, no doubt, also attend Membracids, though I have not observed such associations on the mango, probably because these trees are not favoured by the bugs ? I was surprised to find dead bodies of Membracids in their nests, so that these species, which are of such value as cattle, are sometimes carried away by the *Œcophylla* for food.

It was very remarkable how they ignored the *Monophlebus*, that large white conspicuous bug which supplies the black ant with such a quantity of juice. These bugs often congregate in myriads on the mango, encircling the stems and stalks of the flowers in solid imbricated layers. Unceasingly they suck forth the vital sap; the florets shrivel, being drained of nutriment, the young fruit falls from the impoverished stems, and the trees, which should have borne their delicious produce, give forth nothing but a mass of leaves. Such pests would have been an incomparable harvest for the black ants. Day and night they would meet with continuous attention; their excretions would be swallowed by a greedy host, and a ceaseless stream of busy workers would convey the fluid down to the nest. But in the territory of the red ants they are utterly neglected. They never receive the slightest attention, and their excretions instead of being drained away, accumulate in viscid drops. This want of attention seemed especially remarkable since the red ants were eager to imbibe the fluid and always licked up the limpid drops which the neglected cattle rained down upon the leaves. The black ants would have waited for the fluid to appear, while the red ants, though equally eager to secure it, merely gathered it fortuitously where it happened to fall.

Indeed the red ants seem to studiously avoid the *Monophlebus*. It is one of the very few creatures that escape their fury and which they refuse to carry off as prey. They usually allow it to crawl by unnoticed though in the early part of the season it exists in swarms. In April, when these coccids descend to lay their eggs, the ants and the bugs come in the closest contact; the red and white streams flow through one another, and between them they hold undisputed possession of the whole of the trunk of the tree.

I have told elsewhere how the soldiers of the black ant will sometimes attack this conspicuous bug should it venture to invade the precincts of the nest, and how the body of the bug exudes a slime which clogs the jaws and mouth parts of the ant. This slime makes the *Monophlebus* a distasteful morsel and renders it immune from the attacks of ants. Even the ferocious red ants are unable to deal with it. I placed one on the outside wall of a byre. Being an intruder, it was immediately seized. In a moment it was overwhelmed by the angry swarm ; some gripped it by the legs, others by the flanks; all gathered round it in a deadly ring and commenced to put it to the stretch. Immediately its thin integument was torn by the strain ; its tense body was penetrated by the pointed jaws until its skin was like a sieve and the slime oozed forth through all the perforated points. From the punctures it went straight into the attackers' mouths, with theresult that the ants, being stupefied with the substance, released their nauseous prey. The attackers then began to yield in the struggle. They abandoned their attempt to destroy the enemy, and in the end allowed it to fall from the byre. Thus the clusters of the *Monophlebus* are immune from the attacks of even these most destructive of ants.

Early in the season I found another type of insect maintained by the ants in one of their sheds. This was the caterpillar of a Lycaenid butterfly, the *Zesius chrysomallus* of Hubner. I met with it on only one occasion, there being two individuals in the same byre. It is a sluggish caterpillar, smooth and fleshy, of a dark green or brownish colour which renders it inconspicuous when feeding on the leaves. Its body is a peculiarly flattened shape, shelving away into an edge all round and moulded at the ends into an even wedge. Its back is rounded and gently arched, while its under surface with the legs and suckers lies closely applied to the leaf. A succession of clefts divides its body into rings, the first of which is a tuberculated shield that serves to enclose and protect the head. But the particular spot which attracts the ants is a minute point on the middle line of the back about one-eighth of an inch from the posterior end. It is a reddish and slightly elevated nipple, scarcely the size of the head of a pin, and at its summit is a tiny pore through which the liquid escapes.

One or two of the workers take up a position immediately behind the caterpillar's tail. They rarely engage it on either flank ; they seem to clearly understand that they must operate at one end in order to stimulate the escape of juice. They apply their antennæ to it, stroke it energetically, and then bring their mouths to the dorsal pore in order to receive the precious flow. But with all their attentions they do not seem to have learnt how to differentiate the caterpillar's head from its tail. For I noticed that the ants made frequent errors in their attempts to induce the larva to excrete. It is the same kind of mistake to which the black ants are subject when they attend on the *Monophlebus* bug. Both extremities of the caterpillar look very much alike, and the ants appear to confuse the two. One ant strokes the head and waits in vain for the fluid, while a more fortunate comrade is at the same time employed in gently caressing the tail.

I noticed that the ants carried the caterpillar about, so, in all probability, like the other types of cattle, they move it, when necessary, from byre to byre. The possession of such an insect shows their powers of discrimination, for, though in the habit of destroying many kinds of caterpillars, yet we see how they differentiate those varieties which are useful to them, and carefully domesticate them in their leafy sheds. Indeed I am told by Mr. Bainbrigge Fletcher that, on taking these larvæ from their attendant workers, he found that they were unable to feed of themselves and could no longer thrive when separated from the ants. Here, therefore, is a far more intimate relationship than exists between the ants, and their other class of herds. The caterpillar yields them a supply of liquid, and they in return not only give it protection, but in addition supply it with some essential principle necessary for its healthy growth. Unfortunately I met with no more of these caterpillars and thus failed to witness so interesting a fact. Of the two which I found one quickly pupated and the other very soon died.

Just a final summary of the habits of these ants in so far as they relate to food. They are omnivorous to a conspicuous degree, portion of their supplies being obtained from dead insects and portion being derived from the sap of plants. They combine two fundamental types of industry, being in part hunters which ravage and destroy, and in part peaceful and industrious herdsmen that follow a pastoral life. It is a strange combination of war and peace. In one place they are employed in ruthless destruction, in another they are engaged in studious preservation and are building for this purpose those substantial sheds. Round the foot of the tree we see their deadly struggles, the fierce tenacity of the original capture, the advance of reinforcements to join in the fray, the encircling grip, the remorseless stretch, the straining of the victim into helpless paralysis, and, if this is insufficient, its poisoning to death. Aloft in the branches we see the peaceful operations, the discovery of the cattle, the yielding of the juices, the imprisoning of the herds in the leafy chambers , and their conveyance, when necessary, from place to place.

What a contrast in the activities of living things ! The scene below is one of Nature's dramas ; that above is amongst the most industrious avocations of life. Here destruction, there preservation ; such are the contrasting principles of the ants. But why regard it in the light of contrast ? Is there any construction without proportionate destruction ? Is not all most scrupulously and exactly weighed in the delicate balance of life ? Peace and war, life and death, construction and destruction, all are interknit. The operations of the red ants exemplify this. All life is interwoven. Each living creature is but a single thread in the inextricable scheme of things.

(*To be continued.*)

ORNITHOLOGICAL NOTES FROM A TRIP IN LADAK.

BY

(MRS.) M. L. WATHEN.

During the summer of 1922, I went to Ladak and had the opportunity of making some observations and collecting a small number of the birds of that district.

We left Srinagar on July 7th and, crossing the Anchar Lake, picked up our camp at Ganderbal and started our march up the Sind Valley. As we were pushing through rather quickly on the first part of the journey, I did not have time to give much attention to the birds, but it struck me that round Srinagar and on the Lakes there were singularly few birds this year, though as we got higher up into the forest their numbers increased and at Baltal on July 11th, at the head of the Sind Valley 9,000 feet I saw a great number of different sorts. At this place I watched a pair of Pink-browed finches (*Callocanthis burtoni*) in the birch grove near the bungalow. They were the first I had met with. They were feeding on fallen grass seeds, and were so tame that they allowed me to approach within a few yards of them where I stood in the open watching them for about ten minutes, during which time they came up to within three yards of me without seeming to notice me.

The scenery to the top of the Soji La Pass from Baltal is typical of Kashmir, and Kashmir at its best, but once over the Pass, which, though only 11,300 feet, was covered for long stretches with snow on July 12th, the country changes very rapidly. The forest and the flowers end abruptly and after a mile or two of hillside on which grass and birches struggle for existence, these two die away and one reaches the foot of the Pass to enter the valley of Matayan, a bleak stony plain bounded by bare brown hills in which the only vegetation is a narrow line of scrub along the river bank, and a few corn fields near the dak bungalow. Here too the birds have completely changed. Here for the first time I saw the Siberian chiffchaff (*Phylloscopus collybita tristis*), which from now on abounded in every bush and patch of vegetation, and here also were innumerable larks, the Indian Skylark (*Alauda gulgula guttata*) and the Short-toed lark (*Calandrella acutirostris*), both in the corn as well as on the stony ground. Besides these, Redstarts (*Ruticilla rufiventris*) Golden-fronted Serins (*Serinus pusilla*), Common Rose Finches (*Carpodacus erythrinus roseatus*), Stoliczka's Mountain Finches (*Montifringilla nemoricola altaica*), Choughs (*Pyrrhocorax pyrrhocorax*) and Hill Rock Pigeons (*Columba rupestris*) were common from now throughout our whole journey.

From Matayan to Kargil, about 3 marches at a height of about 10,000 feet, our road lay along the banks of different small rivers running through narrow valleys which are bounded by barren rocks and cliffs. On these three marches I saw a few Meadow Buntings (*Emberiza cia stracheyi*) and wherever there was a village there were always a pair of Magpies (*Pica pica bactriana*) whose colouring and character seemed little different from their European brother. By the rivers where there were suitable cliffs there were from time to time colonies of Crag Martins (*Cotyle rupestris*) and Swifts (*Cypselus apus pekinensis*). Our path lay for the most part over stony or boulder strewn country. The only trees were an occasional poplar or willow grove near the villages, which were carefully planted and protected by a wall. It is by these villages of which one sometimes passes three or four on a day's march of 15 to 20 miles, that one sees the only cultivation, and hence these are the spots in which one finds the most birds and certainly the greatest number of larks.

After Kargil, the country becomes even more arid, and one frequently marches for many miles over high barren stony plateaus on which there is no kind of vegetation and the only life to be seen is an occasional lark. Yet there is something wonderfully attractive about the wildness of it all. One feels one has stepped at last into Central Asia, in which through countless centuries there can have been little if any change either in the country or the people.

One of the most delightful marches is from Kargil to Moulbeck, a march of 23 miles. The road starts over a bleak plateau about three miles across and at a height of about 10,000 feet, surrounded by equally bleak mountains; from this one reaches a small river, the right bank of which one follows all the way up to Moulbeck. For many miles one is over shadowed by rugged cliffs, and in this gorge were quite a number of birds; most of these were the same as already seen but there were as well red spotted Blue throats (*Luscinia suecica abbotti*) some kestrels, a few jungle crows, and a small number of other birds that I could not identify. About two miles from Moulbeck the gorge opens out into a broad valley where for the first time one comes across signs of Buddhism. Here I watched a beautiful pair of Bearded Vultures (*Gypaëtus barbatus*) circling round the monastry crowned cliffs above the village. The only other pair of these birds that I saw throughout our journey was in similar cliffs two marches further on at Lamayuru 11,500 feet, and I have no doubt the birds had their nesting place in both those cliffs though I failed to see it.

After Moulbeck we crossed the Namika La Pass 13,000 feet and the FotuLa Pass 13,400. Cold, bare and bleak yet without snow to be seen anywhere, although the surrounding hills must rise to well over 15,000 feet. There were, few birds to be seen on these Passes; those we did see were mostly larks, Adam's Snow Finch (*Montifringilla nivalis adamsi*), wheatears and redstarts.

The place in which I saw most birds was on our last march from Nimoo to Leh on July 26th at a height of about 11,000 feet. After marching for many miles across a desert like plateau we suddenly came upon the Indus flowing through a small fertile valley below us, perhaps one of the most beautiful sights of the whole journey as it lay like a cool shining gem at our feet. When we reached it we found a fairly wide gently flowing river with low grassy banks on which grew old willow trees and a grey leafed scrub, with here and there a small reed bed; and in this narrow strip of vegetarian were crowded every kind of bird that we had so far seen on our journey and a good many more besides, especially wagtails. Amongst those I had not seen before were gulls, terns, and some kind of plover, also various small waders, feeding on the low grassy islands in mid stream. But we were not long to enjoy this delectable spot, for after following the river for about a mile our road struck away to the left leading us across the worst three miles of sandy desert that we had yet struck. However it was to be our last effort, for we already saw the rich fields and poplar groves with the picturesque monastry and castle on the cliffs behind them which we realized must be Leh. Another mile or so, and we were at last walking down the famous street of the old town where until recent years they still played the original game of polo.

We remained in Leh from July 26th till August 3rd. There is a good deal of cultivation round Leh itself, with pleasant streams running through grassy meadows where wagtails and dippers may always be found. Beyond Leh we went but one march, to the top of the Kardong Pass, about 17,000 feet. It is some 16 miles to the top from Leh. The country was exactly the same as already described, except that at about 17,400 feet, we at last reached snow, and there was a good deal on the top of the Pass. I saw very few birds and as usual very few flowers. Along the edge of the stream at about 14,000 ft., I found a Robin Accentor's nest (*Prunella rubeculoides*). This bird was entirely new to me, but after this I saw several other pairs as we climbed the Pass. At about 16,000 feet, I saw two pairs of Long-billed Horned Larks (*Otocorys alpestris longirostris*). These, a few dippers by the stream, redstarts, choughs and three ravens on the top of the Pass, were about the only birds we saw. One delightful feature of the day was the number of marmots, especially young ones evidently only just out of their holes, playing like fox-cubs round the burrows. Amongst some of these I sat whilst they played within arms reach of me until I had to move on as time was all too short.

We returned on August 3rd by the same route, but though we saw nothing new, there were great changes in the distribution of some of the birds. In places where I had seen many larks on our outward journey, I, now found none at all; and in spots where a month before I had seen no Stoliczka's mountain finches I now found them flying about in big flocks. The larks also were collecting in flocks in certain places, and very wary they had become. The magpies which I had always found in couples in each village were now only to be seen here and there, and then in company with each other and their young. At Dras in the camping ground near the river there were positively swarms of Siberian chiffchaffs and Green Willow-warblers (*Phylluscopus nitidus viridanus*) the latter of which I had not seen at all on my outward journey. It was in fact most interesting to see the change that two or three weeks can make amongst the birds of a country side.

After nearly six weeks of cloudless skies and perfect weather, we again crossed the Soji La Pass on August 18th and dropped down to Baltal to find clouds and rain and much cold wind; and from that day the weather became so broken that we gave up all idea of a further expedition and returned to Ganderbal and the now welcome safety from wind and rain, of a houseboat, and the end of our wanderings.

The following species were identified during the trip :—

1. Tibetan Raven—*Corvus corax tibetanus* Hodgs.

Saw three of these birds on July 19th on the top of the Fotu La Pass, 13,400 feet between Chamba Kharbu and Lama Yuru. They were flying over and did not settle. I returned some three weeks later but saw no more there although I spent two hours on the Pass. On July 31st. I again saw three on the top of the Kardong Pass beyond Leh, about 17,600 feet. I should say they had bred there by the debris and mess there was on the rocks for some distance round the Pass, and from the smell occasioned by it. They flew close round us all the time we were there, continually settling on the rocks. Amongst other things, they kept on flying up with pieces of old prayer flags and bits of paper and dropping them on the rocks around; they seemed in fact considerably disturbed by our presence.

2. Jungle Crow.—*Corvus coronoides intermedius* Adams.

Throughout our march I saw very few of these birds. There were a small number near Matayan. At Kargil on July 17th. I saw a solitary bird, and at Nimoo on July 24th I saw one or two more; but I should say that on the whole they were rare.

3. Jackdaw—*Corvus monedula sœmmeringii* Fischer.

The only jackdaws I saw outside Kashmir were five on August 2nd feeding in a marshy grassfield at Leh. They were very rusty looking and in thoroughly bad plumage.

4. Kashmir Magpie—*Pica pica bactriana* Bonap.

Magpies were common all the way from a few miles below Matayan to Leh. Wherever there was a poplar grove, or a few willow trees there was sure to be a pair and every village had its pair. They seemed to have exactly the same characteristics as the European species, and were bold and tame. I went up to a number of nests but all were empty or had nearly fledged young. The nests which were built some way up the trees consisted of a huge structure of thorny sticks, taken, whenever possible from the grey-leafed thorny scrub by the rivers. This was sometimes two or three feet high before one came to the egg cavity which was made of coarse roots and dead grass, and so well protected all round and above by thorny branches that it was almost impossible to get one's hand inside. Occasionally they built their nests on the top of old ones and once I saw no less than five built one on the top of the other in a willow tree forming a pyramid many feet high.

5. Red-billed Chough—*Pyrrhocorax pyrrhocorax* (L.)

Choughs were common throughout our journey wherever the locality was suitable, and this happened to be the case on the greater part of our marches. By the time we reached Leh at the end of July the young were beginning to appear, and on our homeward journey during August, the young had all fledged. The only place I saw where they were clearly nesting was in some high cliffs near the Indus about 4 miles below Leh and just above Spittak; this was at the beginning of August.

6. Alpine Chough—*Pyrrhocorax graculus* (L).

Only observed between Chamba Kharbu and Lama Yaru on July 19th.

7. The Kashmir Great Tit—*Parus major kaschmirenrsis* Hartert.

Fairly common in poplar and willow groves all the way from Matayan to Leh. At Nimoo on July 19th I found a nest with young.

8. Large Billed Bush Warbler—*Tribura major* (Brooks).

This bird I first saw on July 18th near Chamba Kharbu at about 11,000 feet. Whilst looking for larks' nests in the vegetation near the river I marked a pair of these birds off their nest, shooting one parent bird and obtaining a clutch of 3 very slightly incubated eggs from the nest. The nest was placed about an inch off the ground at the bottom of a small thicket of the thorny scrub which grows by the rivers. It was rather smaller than a lark's nest, well. built, rather deep, consisting of small dead twigs and dead grass stems outside, lined with finer stems and a very, little horse hair. The behaviour of the birds was peculiar in that they never rose from the ground. The first time I disturbed them they ran away very fast in the under growth and I completely lost sight of them. I gave them time to return to the nest and next time they went off in the same way, and although I followed them closely trying to get a clear shot, they refused to rise off the ground, though occasionally they would run up the stems of the tamarisk scrub. They kept close together all the while, both when the hen was on the nest and when she was driven off.

The only other birds I saw of this species were a single bird in the corn at Lama Yuru on July 19th when the corn was fully grown; and again in some more fields at the same place on August 9th but owing to their skulking habits there are no doubt more of them than one sees.

9. Hume's Whitethroat,—*Sylvia aethocea* Hume ? ?

There were very few of these birds in Ladak. I saw one pair and shot one of them at Spittak on July 26 in the reeds and vegetation near the Indus, about 11,000 ft. And I watched another pair and shot one of them in a willow grove near a stream above Leh on July 29th, about 11,800 feet. These did not appear to be nesting, either by their manner, nor from the careful search I made in every possible place in which they might have placed their nest. It would therefore appear as far as my experience went that the white throat is not common in Ladak.

10. GREEN WILLOW WARBLER.—*Acanthopneuste nitidus viridanus* Blyth.

The only green willow warblers I saw were at Dras on August 14th and 15th at about 10,000 feet. Here there were quite a number of them in a willow grove near the river. It was a place admirably suited to them with young willows just growing, and long grass and other tangled undergrowth, and a few tall willows and poplars growing round outside the grove, which was some four acres in size. In one case I saw the young still being fed, but the rest of the birds I saw were, if young, fully fledged.

11. SIBERIAN CHIFFCHAFF.—*Phylloscopus collybita trists* Blyth.

This was perhaps the commonest bird all the way to Leh. It began in the tamarisk scrub along the river side below Matayan and from there wherever there was a possible bush in which to make their nest there was sure to be a pair. I found the first nest on July 14th a few miles beyond Dras at about 10,000 feet in a willow grove; it was near a stream and contained three fresh eggs ; it was placed between some young willow shoots and the main stem, a foot from the ground and it consisted of dead leaves, with an inner lining of the cottony fluff from the willow seeds intertwined with goat's hair, and lined inside with small grey feathers ; it was extremely difficult to see, and very like the English species in all its features. The next nest I found was on July 17th between Kargil and Moulbeck at about 10,000 feet close to the river in a thorny bush, it was placed a foot from the ground, and this time consisted of dead and green grass outside, and was lined with feathers ; it contained no eggs. At Basgoo about 11,000 feet, on July 24th, I found a nest in a rose bush containing 3 well grown young birds ; this nest was also close to a stream. At Spittak on July 26th about 11,000 feet there were several pairs feeding their young in the reeds by the Indus. At Leh on July 26th to August 4th, 11,500 feet, I found three nests in the thorns round the top of the 4 foot wall which surrounds the dak bungalow compound. One had forsaken without laying, one had forsaken after laying three eggs ; the other on August 3rd had three eggs on the point of hatching. Three seems to be the number they always lay. There were many pairs of them in the willow groves round Leh, mostly with young. I noticed that the song of this bird is practically the same as that in England though perhaps not quite so decided a note.

12. GOLDEN ORIOLE—*Oriolus oriolus kundoo* Sykes.

I came across golden orioles three times on our journey. On July 24th at Nimoo about 11,000 feet a pair were clearly nesting in the Lombardy poplars round the dak bangalow. On our return journey on August 4th the same pair were still there, and later in the day we saw two pairs in the apple and poplar trees of the Basgoo camping ground also 11,000 feet. A pair were in the poplars of the camping ground at Kargil on August 13th about 9,000 feet.

13. WHITE-CAPPED REDSTART—*Chaimarrornis leucocephala* (Vig.).

Common by the rivers as far as just beyond Kargil after which I saw no more.

14. INDIAN BLACK REDSTART.—*Ruticilla ochrurus phœnicuroides* (Moore).

This redstart was one of the commonest birds all the way to Leh up to about 17,000 feet. Wherever there were big enough rocks or walls, or indeed, any possible place to nest in, a pair was sure to be found. I did not succeed in finding a nest as they were always placed in the most inaccessible holes whether in boulders or walls. They appeared to be in all stages of incubation, and in Leh and on our homeward journey in August the young were strong on the wing. They are delightfully tame and every bungalow has its pair.

15. Eastern White-spotted Bluethroat.—*Luscinia suecica abbotti* (Richm.).

My first sight of the White-spotted Bluethroat was in the low growing scrub besides the Indus at Spittak on July 26th, about 11,000 feet, where I saw a pair feeding their young. On July 29th I marked a cock bird to its nest with food for its newly hatched young. There were 3 young and one egg on the point of hatching. The nest was placed at the foot of, and in the middle of a mass of young willow shoots round a willow tree, and consisted of fibrous roots lined with very much finer ones and fine dead grass leaves. The nest was 2½″ across the centre by 2″ deep. On my homeward journey I saw a number of these birds feeding their young all the way as far as Kargil. Doubtless they had been sitting on my outward journey, and I had therefore missed seeing them.

16. Robin Accentor—*Prunella rubeculoides* (Moore).

I only found the Robin Accentor in one small area, namely, up the Kardong Pass on July 31st. I first saw it at about 14,000 feet where a pair were feeding their young in a nest under a rock about five yards from the stream. The nest was placed on the ground just under the rock in a tangle of wild flowers; it was so well hidden that I should have found it with difficulty had I not noticed a tiny "run" worn in the long grass, and leading to the nest. The nest consisted of dead grass stems and leaves, lined with sheep's wool and a little hair. It was about 2½″ across by 2″ deep, and contained 3 young. After this I saw several pairs near the stream up to about 16,000 feet and above that they were inhabiting the barren stony ground up to about 17,000 feet. I should say by their behaviour that these pairs still had eggs, but I was unable to look for their nests.

17. Gould's Desert Chat—*Œnanthe deserti atrogularis* (Blyth).

I shot this bird near the Fotu La Pass (13,400 feet) at about 12,000 feet on August 9th. On both journeys I had seen a few wheatears both on the Fotu La Pass and the Namika La (13,000 feet) where I should say by their manner they were nesting.

18. Gold Finch—*Acanthis caniceps* (Vigors).

Met with a few in the willow groves round Leh at the end of July.

19. Common Rose Finch—*Carpodacus erythrina roseata* (Hodgs.).

From the Soji La Pass to Leh this finch is very common. It is one of the most conspicuous birds of the road, both in its cheery rather noisy song, and its colouring. It is to be met with in all the willow and apricot groves, as well as on the rocky hill side where the only vegetation is a few scanty rose bushes. It was clearly nesting all the way to Leh, and though I never found a nest I saw a good many young on my way home in August.

20. Golden-fronted Serin—*Serinus pusillus* (Pall.).

This is one of the commonest birds all the way from the Soji La to Leh during July and August. It is to be seen either in pairs or in small flocks both on the rocky hillsides where I imagine it nests in the rose bushes, and in the cultivated country where one usually sees it amongst the willow trees.

21. Cashmere House Sparrow—*Passer domesticus parkini* Whistler.

The sparrow in Ladak is exactly similar in its customs and manners to its English relative. It is common all the way from Matayan to Leh, every bungalow having four or five dirty untidy nests above the verandah. During July it was for the most part still nesting, but in August the country side was over-run with flocks of young birds, and the damage they do to the crops must be very considerable.

22. Adams' Mountain Finch.—*Montifringilla nivalis adamsi* Adams.

This mountain finch is an inhabitant of the barren stony country, preferably high plateaux and passes. I first met with it on July 18th on the top of the Namika La Pass, 13,000 feet, a stony bare piece of country with very little vegetation. On July 19th on the Fotu La Pass, 13,400 feet, I again saw it, and as we got near to Leh it was common on all the stony plateaus. At Leh itself it was very common at about 11,500 feet just beyond the cultivation limit, where I should say it was nesting in the Buddhist chortens. It was here that I saw it with fledgling young for the first time, on July 26th. It was common up the Kardong Pass up to about 15,000 feet which appeared to be its limit. On my return journey I saw quantities of young birds, sometimes going about in small flocks.

23. Mongolian Desert Bullfinch—*Erythrospiza mongolica* (Swinh.).

I saw one specimen of this small finch which I shot at about 10,000 feet on August 19th near the stream at the foot of the cliff that forms the gorge below Lama yuru. It appeared to be feeding on grass seeds in the dry bed of the stream.

24. Stoliczka's Mountain Finch—*Fringilauda nemoricola altaica* (Everson.)

There were great numbers of these finches during the first part of our march in July, from the Soji La to Kargil at a height of about 10,000 feet. After that I only saw a few between Kargil and Lama Yuru, and beyond this I saw none at all. On our homeward march in August there were large numbers of them going about in flocks ; I should imagine, many of them were young birds. They were mostly to be found in the boulder strewn hillside, though I occasionally came across parties of them in the tamarisk scrub by the rivers. One or two pairs near Dras and Matayan clearly still had young in the nest, about August 16th, but I failed to find them.

25. Eastern Meadow Bunting—*Emberiza cia stracheyi* Moore.

I met with a few specimens of this meadow bunting on our earlier marches between Matayan and Moulbeck in the middle of July at a height of about 9,000 feet. But after this I never saw another bird. Those I saw were in rough boulder strewn country. On our return journey in the middle of August the few birds I saw were feeding their young. I cannot say they were common anywhere.

26. Crag-Martin—*Riparia rupestris* (Scop.).

Common throughout where rocks and clifs were suitable. They seemed to prefer a site near a river. I did not discover whether they were nesting but there were quite a number of the birds in each colony.

27. House Martin—*Delichon urbica* sub. sp. ?

These I saw from time to time in suitable localities, namely where there were cliffs near the river, such as those along the Indus between Nurla and Saspul but they were never in great numbers.

28. Hodgson's Pied Wagtail—*Motacilla alba hodgsoni* Blyth.

Throughout the journey I saw a few of these birds in suitable localities, some of them were undoubtedly nesting.

29. Grey Wagtail—*Moticilla cinerea melanope* Pall.

I saw several of these birds in and near Leh, about 11,500 feet. On July 29th I found a pair breeding near a stream in some grassy meadows. The nest was placed under a rock within a few yards of the stream. It was so well concealed by the vegetation round the rock that it was with difficulty that I found it. It contained three well grown chicks. The nest consisted of roots and a few dead leaves lined with fine dead grass. The birds seem to resemble very closely the English species in all their habits and manners.

30. Hodgson's Yellow-headed Wagtail—*Motacilla citreola calcaratus* (Hodgs.).

This is the commonest of all the wagtails in Ladak. Between Matayan and Leh one sees it continually on the route, wherever there is a suitable locality. I did not find its nest but in many places it was quite clearly breeding amongst the rocks in the grassy meadows near streams.

31. Long-billed Horned Lark—*Otocorys alpestris longirostris* (Moore).

I found two pairs of Horned Larks on the Kardong Pass beyond Leh on July 31st between 16 and 17,000 feet. They were evidently breeding but I failed to find their nest. They have a charming song which they utter from the top of a boulder. The country I found them in was barren stony country with boulders here and there.

32. The small Kashmir Skylark—*Alauda gulgula guttata* Brooks.

The Kashmir Skylark is to be found commonly distributed throughout Ladak from about 8,000 to 14,000 feet. They are mostly to be found in cultivated ground or in vegetation near the rivers. They were clearly nesting at Dras on July 13th and as we got nearer Leh many of them were feeding their young. On my return journey many of the young had fledged.

33. Short-toed Lark—*Calandrella acutirostris* Hume.

The Short-toed Lark is fairly common throughout Ladak, on the open stony ground both in the valleys and plateaux from about 9,000 to 14,000 feet. I found one nest with 3 fresh eggs on the stony ground at Matayan about 10,000 feet on July 12th. The nest was built in a slight depression under a small greyish plant that grows amongst the stones. It consisted of small dry twigs and dry grass stems, lined with a little wool and goat hair, and one feather. As we got nearer to Leh these larks had young, and on our return journey in August most of the young had flown and were moving about in small flocks which were very difficult to approach.

34. White-breasted Asiatic Dipper—*Cinclus cinclus kashmiriensis* (Gould)

A pair watched feeding its young, on July 29th, in the bank of a stream above Leh, about 11,800 feet. The nest was far under the bank and quite inaccessible. Another pair were seen up the Kardong Pass on July 31st, at about 15,000 feet.

35. Asiatic Cuckoo—*Cuculus canorus telephonus* L.

Very common on the Soji La. After this I saw a few at Chamba, Karbu, Kalsi and Spittak, but they were nowhere common.

36. HOOPOE—*Upupa epops* L.

Common all the way to Leh round the villages and inhabited parts.

37. SWIFT—*Micropus apus pekinensis* (Swinh.).

A few seen throughout the journey in suitable localities, usually where there are cliffs near a river.

38. BEARDED VULTURE—*Gypaëtus barbatus.*

Two pairs seen, one at Moulbeck about 10,000 feet, one at Lamyuru about 11,000 feet. Both pairs inhabited the cliffs below the monasteries. I did not see their nests but from their behaviour they evidently bred in these cliffs.

39. VULTURE SP ? *Gyps sp* ?

I saw a few brown vultures near the Soji La and one more at Dras.

40. HOBBY—*Falco subbuteo subuteo.*

Two pairs were seen, one was nesting in the poplars of the camping ground at Kargil in August at about 9,000 feet, the other was nesting in the poplars of the Dak Bungalow at Nimoo, about 10,000 feet, in July and August.

41. KESTREL—*Falco tinnunculus* L.

Seen occasionally throughout Ladak, sometimes in rocky country, sometimes in poplar groves. In the Residency garden at Leh, 11,500 feet, a pair were nesting at the end of July.

42. INDIAN BLUE HILL-PIGEON—*Columba rupestris turkestanica* Pall.

Common all the way amongst the rocks and cliffs from about 9,000 to 14,000 ft.

43. SNOW PIGEON—*Columba leuconota leuconota* Vig.

Common over the Soji La Pass.

44. INDIAN TURTLE DOVE—*Streptopelia orientalis meena* (Sykes.)

Met with a few pairs in apple and poplar groves on August 4th at Basgoo about 11,000 feet.

45. CHUKAR PARTRIDGE—*Alectoris græca pallescens* (Hume).

Heard them calling occasionally along the route from Matayan to Leh and saw a family with 14 well grown chicks between Kargil and South Karbu on August 15th about 10,000 feet.

46. GULL—*Larus sp.* ?

A few pairs seen on the islands in the Indus below Leh on August 4th at about 11,000 feet. I do not think they were breeding. These were probably *Larus brunneicephalus Jerd.*

47. TERN—*Sterna* ?

A few pairs seen on the islands in the Indus in company with the gulls, on August 4th at about 11,000 feet. These were probably *Sterna hirundo tibetana* Sand.

THE COMMON BUTTERFLIES OF THE PLAINS OF INDIA. (INCLUDING THOSE MET WITH IN THE HILL STATIONS OF THE BOMBAY PRESIDENCY.)

BY

T. R. BELL, C.I.E., I.F.S. (Retd.).

(*Continued from page* 455 *of this volume.*)

PART XXX. *

Family—HESPERIIDÆ—*continued.*

Genus.—ODONTOPTILUM.

This characterised as follows (Swinhoe in *Lipidoptera indica*, vol. x, p. 80):—

Antennæ.—A little more than half the length of costa, club moderate, sharp and curved, the tip blunt.

Palpi.—Porrect, densely clothed; third joint stout, short, blunt.

Hind tibiæ.—With two pairs of spurs; in the male with a dense, recumbent tuft of hairs at the base of the *fore coxæ.*

Fore wing.—Vein 12 ends on the costa well before end of the cell; discocellulars inwardly oblique in a straight line, the lower a little longer; vein 3 from one-sixth before lower end of cell, 2 from one-third from base; cell a little less than two-thirds the length of costa; costa arched, apex truncate its termination somewhat acute; in the female the outer margin is angled at vein 4. Outer and hinder margins of equal length.

Hind wing.—Vein 5 fairly well developed, discocellulars in an even, gentle, inward curve, the lower the longer; vein 3 emitted from close to lower end of cell, 2 from about one-third before end; outer margin angled between veins 6 and 7.

Egg, larva, pupa and *habits.*—See below. Only one species.

204. Odontopilum angulata, (*Felder*).—Male. *Upperside* chocolate brown. Fore wing with a rather broad chestnut-brown band before the middle that is outwardly-curved and slightly outwardly-angled at its middle; a similarly-coloured, highly sinuous postdiscal band having two semihyaline, subapical dots in it close to costa in interspaces 7 and 8, these spots close together, sometimes rather elongate; a small, round, similar spot at the lower end of cell, sometimes two forming a lunule on the discocellulars; a small, round spot near the base of interspace 3 and a thin lunular spot below it in the middle of interspace 2, all except the cell-spots against the inner side of the postdiscal chestnut-brown band; all the outer part of wing beyond the postdiscal band paler, brighter chestnut than the rest of the wing; one or other of the discal spots often absent. Hind wing. Covered with long whitish hairs and crossed by a narrow whitish antemedial line and a submarginal, similar line, the latter running straight down from costa to the outer margin near its middle where it is sharply angled and runs inward straight and broad to abdominal margin above anal angle; the former bent sharply round at its lower end, extends or runs upwards—it is angled upwards on vein 1 along which its lower part runs for a bit—as a postmedial line close inside the submarginal one to the costa, being angled outwards again between veins 2 and 3 as far as vein 4 where it nearly touches the sub-marginal line, where it is again angled, this time turning straight up to vein 7 where it actually does touch it, then angled shortly in and up to costa straight, the submarginal line and this last line enclosing a little oblong of ground colour between vein 7 and the costa that is rather conspicuous; outside the submarginal line at apex is a rather broad, chestnut-brown patch with a small, submarginal blackish spot or two below it in interspaces 3 and 5; margin below this apical patch white with the cilia white with a double brown line through them; cilia of rest of wing and of fore wing brown with indistinct whitish tips. *Underside:* Fore wing. With the subapical dots as on the upperside, the costa very narrowly and the outer third of the wing pale chestnut-brown, the inner two-thirds of the wing covered with white setae and scales; antemedial band and spots as on upper side. Hind wing. White, the base slightly suffused with grey, a black spot above the middle of the cell, a larger brown spot with white scales on it in the same interspace further out; apical patch as above, the outer white line with some brown marks on both its sides and a brown, marginal band becoming obsolete upwards with the veins crossing it thinly white. Antennæ with the underside of club chestnut, black above; palpi, head and body above concolorous with the wings; below: palpi, body and legs are white.

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* We regret that the previous part, pp. 429-455, of this Volume was incorrectly headed XIX instead of XXIX.

In the Kanara specimens the upperside of fore wings has the area between the antemedial, brown band and the postmedial brown band covered with white, short hair-scales, ochreous near costa and near inner side on inner margin—the middle of the wing thus appearing broadly grey; there is a slight fringe of hairs along inner margin, brown some way out from base, then ochreous, then white, then again, beyond the grey band, brown. The abdomen is strongly suffused with white on distal third and has segmental white bands on basal part above. Female.—Like the male above and below but the underside of hind wing is purer white, the spots are larger and the outer band on margin is composed of largebrown spots with smaller submarginal spots. Expanse up to 50mm.

Egg.—The shape is that of a dome, the sides, however, elongated—a short cylinder with a domed top would more express it, and with the base very suddenly contracted. The surface is shining but covered all over with a thin coating of white, fine, silky-woolly looking, wavily curled hairs that obscure the ribs nearly completely and also cover the leaf-surface for a short distance all round; when that is removed—it is somewhat difficult to remove—the ribs appear, 18 in number, very low and thin, about 0·05 mm broad, some 12 or so reaching the circumference of the flattened, smooth, circular, 0·15mm—wide space round the micropyle on the very apex of the egg, the rest ending short of it; these ribs are about 0·2mm apart at the broadest part and about 0·025mm high; between these ribs the surface is dented all over with little, irregular, flat-bottomed depressions which are dull, the raised bands or spaces or lines between only being shining. The *colour* is a rich peach-colour when laid but becomes duller and finally black before the larva emerges—because of the large, black head. B: 1·3mm; H: 0·95mm.

Larva.—Immediately after leaving the egg, has the body peach-coloured, the head deep red-brown; there is a translucent-white, longly bifid, subdorsal or dorsoleteral hair to each segment as well as a similar lateral or supraspiracular and subspiracular one, all comparatively long, the stem as long as the branches; on the head are similarly translucent-white, decumbent (more or less), hairs, each one, however, not only branched, but each branch again branched, the ends, in fact, somewhat palmated like a reindeer's horn only not so definitely—these hairs few, just in the spots where the main tubercles ordinarily exist. The larva is about 2mm long by 9·7mm broad and the enormous head is 0·95mm!

The full-grown larva is a very different looking thing. The body is much more spindle-shaped than that of the egg-larva (there it is rather trapeze-shaped in transverse section), fattest in the middle, fining to both ends, the front end to the large head which is much broader and higher than segment 2, the back part to the anal end where segment 14 is rounded at the end, but rather narrowly so, the dorsal slope from middle—which is the highest part of body—to the anal end is more or less a straight line; when the caterpillar is at rest, the body seems to be thickest at about segment 4 as the front segments are then contracted somewhat; the anal segment (14) is rather broad at base, the sides straight, the extremity rounded and only about half the breadth of base, the front margin convexly curved backwards leaving segment 13 a transverse piece longest in the dorsal line and disappearing ventrally, the front margin straight, its greatest length half that of 12 and rather less than half 14; segment 2 nearly wholly occupied by a brown-red, long, chitinized, shining collar set with short, erect, simple hairs rather sparsely, the segment proper visible as a narrow whitish band along the hinder margin—when stretched, the front part of segment or neck shows somewhat broadly dull-reddish in front of the collar too; *head* far broader and higher than segment 2, broadly heart-shaped, the lobes broadly rounded, the whole surface hidden by dense hair, that occupying the upper half and down to the gulae laterally erect, minutely feathered, the central frons nearly bare, most of the hairs whitish but leaving a broad, transverse frontal band not reaching the hinder margin of head on either side black— that is the hairs on it are black, the lower part of face covered to mouth-opening with long, decumbent, silky-white, fluffy-feathered hairs which are glistening and hide the clypeus and eyes completely; true clypeus quite half as long as height of head, shaped like a gothic window, rather longer than broad, apex acute; false clypeus reaching three-quarters the height of head or more, broadly arched over true clypeus with apex, none the less acute also; the labrum opaque-white, transverse, one-quarter length of true clypeus, both margins straight, quite twice as broad as long; the ligula rather narrower, rather shorter than labrum, rusty in colour with a wide, shallow, curved sinus occupying the whole front margin, broadly kidney-shaped; the basal joint of antenna white, the second shining black; the mandibles large, dull-orange with darker ends, these ends shortly, bluntly toothed practically entire (cutting-edges); the eyes arranged 1 to 6 in a straight line, 1 just a bit behind, very close to 2, numbers 3, 4 a diameter of an eye apart and from 2, number 6 four eye-diameters from 4, number 5 behind making an equilateral triangle with 4 and 6; number 1 is rather small, the others larger, coequal the colour of the whole head chocolate beneath the hairs, rugose as to surface. *Surface* of larva with the segments well-marked, the usual parallel, impressed, fine, transverse lines across before hinder margin and parallel to it; the whole body except ventrum covered with small 0·025mm high and wide, round-topped, conical, white tubercles, each bearing a thickened, whitish hair which is erect, 0·2mm in length (variable somewhat) and has the top flattened palmately with two short points, these tubercles (and, hence, hairs) closely set, a couple of tubercle-diameters apart; these hairs slightly longer along the dorsoventral margin and margin of anal flap; this flap, by the way, overreaches the fairly stout but short anal claspers. *Spiracles* small, very broadly oval, rounded at extremities, soiled very light-yellow with thin, white borders, those of segments 2 and 12 twice as large. *Colour* of the body is a greenish-white with yellow tinge, ventrum greenish. L. 28mm; B: 4mm.

Pupa.—Very similar to that of *Abaratha ransonnettii* in *shape*; it has the fore-end broad and square with, however, an oblong, blunt snout or process, from the head between the somewhat prominent eyes, which is slightly longer than broad, porrect with a slight inclination up: it is about as broad as one-third the distance between the eyes or about three-quarters the length of segment 2, the lateral outline of the head and segment 2 is parallel-sided, the sides perpendicular to the front-end and these sides are about as long as the square end reckoned from it to shoulders—and, perhaps, really, slightly diverging backwards; the *head* has the vertex about half the length of one of these sides and it has an inclination of about 45° to the longitudinal axis of the body; then the frons has the process just mentioned proceeding from its upper margin, the plane of frons being perpendicular to the axis, the clypeus being a triangular, more or less equilateral end-piece running between the eyes ventrally with, beyond, a narrow, diamond shaped piece (the ligula ?) inserted between the two halves of the base of the proboscis and the palpi (eyes); the proboscis reaches to the ends of wings and free beyond them as far as the hinder margin of segment 9, that segment having a central, longitudinal depression to receive it : the fore legs reach about one-third of the wing-length towards the end of wings, the mid legs and antennæ about two-thirds, the latter a little shorter than the mid legs ; the ventral line is slightly convex from fore-end to base of cremaster and that organ is then curved downwards ; the dorsal outline back from the vertex of head is at an angle of 45° to the axis as far as about the middle of thorax, then curved round to become parallel at about three quarters the length of thorax from its front margin, then suddenly falls to the hinder margin of segment 4, the hinder margin of the thorax itself being somewhat bulging—that is the hump of convexity of the thorax starts from it ; from the hinder margin of segment 4, the dorsal outline again rises gently to middle of body, then descends in a gentle incline to cremaster ; the lateral outline has the shoulders evenly rounded with a very slight constriction where the body-string passes, the middle of the body being about as broad as the shoulders, after which the outline narrows to cremaster ; the anal segment is rather narrow, the front margin straight with a small rounded sinus on the dorsal line : the basal piece is shaped like a somewhat convex cap or lid stuck on the end of the body, the plane of the lid prependicular to longitudinal axis or inclined ventrally, its ventral side somewhat flattened, its upper, dorsal middle produced out into the down-curved cremaster which narrows in its middle and dilates again at its end, is longer than its basal " lid " and about as broad as long at extremity which is broadened out to accommodate the closely-set, copious, hooked shaftlets ; underneath the lateral ridges of this cremaster extend backwards and enclose in a circular space the clasper-scars, dorsally it is channelled down the middle ; this whole segment 14, including the lid and cremaster, is as long as segments 13+12 ; segment 13 is a transverse piece, shorter than 12 in the dorsal line, disappearing ventrally and has, on the dorsal line, a small, rounded sinus corresponding exactly to that of the front margin of segment 14 ; segment 12 is longer than 13 by a little ; segment 11 is rather shorter but, with its rather long, bevilled, front margin, somewhat longer and coequal in length (both with and without their bevilled margins) to segments 10 or 9, or 8 ; their hinder bevilled margins are about equal in length to the opposing front margins of the succeeding segments ; segments 7, 6, 5 are nearly equal in length to 8, the last, perhaps, rather shorter : their margins are all straight ; segment 4 is about one-third of 5 in the dorsal line as the hinder margin of the thorax is a semi-circular curve, produced somewhat in the dorsal region—really a parabola —backwards ; this hinder margin of thorax meets the wings in a rather deep, somewhat broadly rounded angle of under 90°. *Surface* of pupa is moderately shining, transversely finely corrugated on thorax, head and segment 2, obscurely pitted on the abdomen, the segments all very distinct, the veins of wings obtusely prominent, the head-snout very rugose, the cremaster also, the former confusedly, irregularly, the latter longitudinally, a small, rather obscure, tubercular point on eye (the 3rd joint of palpus ?) also rugose and the spiracular expansion of segment 3 (segment 2 really) very prominent ; the whole body covered with short, fine, waved or erect, whitish hairs which are only about as long as a spiracle and are spaced about their own lengths from each other, these hairs a little longer on eyes and head-snout. *Spiracles* of segment 2 with a prominent, golden-orange, spongy-looking expansion which is erect, transversely longer than longitudinally, otherwise nearly hemispherical with an obscure stem, situate on the surface of segment 3 just at its front margin and nearly as long as the head process ; the other spiracles moderately broad ovals, rather small, soiled whitish with rather coarse, shining-black, raised borders. *Colour* of the pupa very light-green on head, thorax and wings, yellowish-green on abdomen ; or the colour may be pinkish; and the following marking, all black: a large spot covering basal joint of palpus ventrally, a dot on second joint (these are on the eyes as the palpus overlies the eye) and a large spot on the third joint, another at the hinder margin of eye, the whole of the snout black, a subdorsal patch or large spot on vertex of head; a lateral one on segment 2; on thorax: one on each shoulder and another behind, the spiracular expansion surronded black, one dorsally on front margin, a lateral one just before middle and another lateral one behind middle and one on dorsal line at hinder margin; a dorso-lateral spot as well as one surrounding the spiracle on segments 4 to 12—the spiracular ones wanting on 4, 5 where the spiracles are not visible; segment 13 and segment 14 with the little sinus on front margins bordered black and the cremaster black at end in a dorsal line as well as along the ventral extensor-ridge and the wings with the ends of veins along outer margin all marked black as well as the submedian vein and a long streak or line well inside the abdominal margin; all these spots and marks are not there invariably as some may occasionally be wanting; the whole pupa is, besides, covered all over with a thin, white, cereous powder. L: 18mm; B: 5mm.

Habits.—The eggs are laid, always singly but occasionally several on the same plant, on the uppersides of young leaves in moderately sunny places. The young larva eats its way out through the side towards the top and does not eat the shell, but goes straight off to the edge of the leaf where it cuts out and shapes a circular piece about 3mm. in diameter and turns it over on to the top surface. This it leaves attached to the edge by a small hinge, coats it inside with silk very thickly and fixes it down firmly, leaving a place for going in and out near the hinge. It then settles down on the lid with its back downwards and eats little spaces out of the cuticle of the lid but never eats the whole substance through as it does later on. It feeds also on the edge of the leaf. Later on it makes another cell and, as it grows, a different one, larger, to suit its size; but these later houses are made by turning over a large triangular piece, not on to the top but on to the bottom; the process (the cell is circular only in the first stage) is: the larva eats two lines from the edge at some distance apart, both converging as far as the midrib where they all but meet; this piece is turned under the main surface and the caterpillar sits on the main leaf with its back turned earthwards; it fastens the piece down all round and carpets its bed very thickly with silk; it goes out to feed and cuts holes of all shapes and sizes in the leaf-surface outside the confines of its cell all round it for some reason best known to itself. It eventually pupates in a cell of this description and the pupa is attached by the tail and a body-band. The larvæ are sluggish and have nothing interesting in the way of habits; they lie with the head turned round on the side. The butterfly is a quick, spasmodic flier, never going far and pursuing an erratic course, this way and that, sideways as well as up and down; it rests on leaf surfaces with its wings horizontally outspread and is quite fond of flowers; it prefers shady places to excessive sunlight. The wings are never flat although horizontal for their surfaces are convexly curved, the outer edges being bent down. Many specimens have been bred in Kanara District at all times of the year and the insect is fairly often met with wild. It is not difficult to capture at flowers or when basking on the uppersides of leaves. It rests on the undersides. The foodplant of the larva is *Allophyllus Cobbe* (*Sapindaceæ*), a rather extensive climber with three-partite, softly velvety leaves and long, thin racemes of small, whitish flowers which attract butterflies in numbers. The butterfly is found in China, India, Burma, the Malay Peninsula and Archipelago. "The type came from China, the type of *sura* from N. E. Bengal, it is a common species all over India and Burma, except in desert tracts and has been recorded from many places. We give Fruhstorfer's local forms in our list of allied species but we very much doubt their specific distinctness, because none of the specimens from the Malay Archipelago that we have examined show anything more than the ordinary variations found in specimens from every locality." (Swinhoe, *Lepidoptera Indica*, vol. X, p. 82; and pl. 777, figs. 1 to 1c).

Genus 5.—ABARATHA.

The following is from Swinhoe's *Lepidoptera indica*, vol. X, p. 73:—

Antennæ.—Less than half the length of costa, shaft slight and the club moderate, short, curved, with the tip blunt.

Palpi.—Porrect, second joint thickly scaled and the third joint short, stout with the tip blunt.

Hind tibiæ.—With two pairs of spurs. The male has a long, stiff brush of jet-black hairs from the base of the *front legs* as long as the legs themselves.

Fore wing.—Vein 12 ends on the costa some distance before the end of cell; discocellulars highly inwardly oblique, in one straight line; vein 3 emitted about one-sixth before lower end of cell, 2 from one-third from base; cell two-thirds the length of costa, costa gently arched, apex subacute, outer margin evenly convex, as long as the hinder margin which is straight.

Hind wing.—Vein 5 well developed, discocellulars faint in a slight, even curve; vein 3 from quite close to lower end of the cell, 2 from about one-third before end; outer margin highly sinuate, being slightly excavated below apex and somewhat deeply between veins 4 and 6 and again slightly excavated below between veins 3 and 1.

For *egg, larva, pupa habits* see below as there is only the one species, *ransonnettii*. Swinhoe informs us that Watson sank this genus to the African *Caprona*, but "the Indian species differ from the African in the length of the cell of fore wing, the well-developed vein 5 of the hind wing, the robust, protruding last joint of palpi and other less important characters." He also tells us that "this insect is very common throughout the district at all seasons; it is very variable in colour, running from bright golden-brown above, with few markings to dark-brown with many; the golden-brown form (named *C. taylori*, deNicéville, for us by deNicéville) has been bred in the cold season from larvæ and pupæ in all respects to those which produce *C. ransonnettii* in the monsoon. (*Davidson, Bell and Aitken*)." The difference even goes further between the seasonal types. The angular prominences of the hind wing of the monsoon forms are very distinct, pointed, tooth-like whereas in the cold-weather individuals, especially in the male, they become shorter, blunter, rather much rounded.

205. Abaratha ransonnettii (*Felder*).—Wet-season Brood.—Male. *Upperside :* dark ochreous-brown. Fore wing. With three small, semihyaline white, subapical, elongated spots in an outwardly-curved series from near the costa ; two in the end of cell, often conjoined, sometimes separate, the upper then often minute, sometimes absent ; a small spot near the base of interspace 3 with a much larger one inwards of it in interspace 2 with two small dots below it in interspace the first below its outer edge, the other inwards below that again ; the cell blackish, the basal half of the internomedian interspace—on upper side of vein 1 that is—and below vein 1 blackish ; a blackish fascia on the outside of the subapical spots and another inwards outside the discal spots; a marginal, narrow line of ochreous spots that is double upwards from vein 4 and a submarginal line of three larger ochreous spots in interspaces 1, 2, 3 (Swinhoe calls these ochreous spots "a marginal band of pale pinkish-brown, the upper half double, with some pinkish suffusion outside the dark fascia, all very difficult to describe and somewhat indistinct in dark specimens"—which is true enough for individuals in which the ochreous spots are not developed as happens in those occuring half way between the wet-and dry-broods as they are generally called). Hind wing. With a double pinkish-ochreous lunule in the end of cell closely followed outwards by a similarly-coloured, outwardly-curved medial line of spots, one in each interspace, uppermost subquadrate, the others somewhat elongate ; outer part of the wing in fresh examples overlaid with pale-grey scaes ; a narrow, brown band on outer margin with its inner edge somewhat diffuse and sometimes bordered by ochreous lunules in the interspaces. Cilia of fore wing brown, of hind wing whitish with small, brown intervals at ends of veins ; in really dark specimens the cilia of fore wing are also checkered thus. *Underside :* Fore wing. Pale rufous-brown, the basal third suffused with white with an irregular brown line across it, the spots and fasciæ as above, the space beyond them innocent of markings. Hind wing. White, the extreme outer margin rufous-brown, some blue-grey suffusion inside it and the base of wing similarly suffused ; within the blue-grey, marginal suffusion is a complete series of submarginal, blackish spots that may be very faint, one in each interspace and two blacker spots in continuation below the costa that are always quite plain although they may be brown in certain individuals ; a thin black, long lunule outside end of cell. Antennæ coloured like body, the shaft speckled white above, the club white below, the shaft brown ; palpi white below with third joint altogether brown, above brown ; head brown with a white tip above eyes at base of antennæ ; abdomen above concolorous with wings, below white as well as legs.—Female *Upperside* paler than the male, the base and outer brown fasciæ consequently more prominently brown as also the outer pale markings which are still paler and more distinct making the wing more variegated. Hind wing. With the discal band of pale spots similar with a few additional pale spots outside ; the discal pale spots have a row of brown spots running through their outer ends ; the grey suffusion limited to the outer margin and the abdominal fold. *Underside* ; Fore wing. Much paler than in the male, markings similar, the brown patches more prominent. Hind wing. With the white portion more limited and often of a duller colour, more grey than white ; all but the uppermost spots of the submarginal series more or less joined together into a band ; a discal series of small, brown spots, one in each interspace. Expanse 40mm. and over.

Dry-season Brood—*taylori.*—Male and female differ from the above in being golden-brown instead of ochreous-brown, none of the ochreous markings on the uppersides at all, the brown fasciæ fainter, thinner ; on the underside the hind wing has the white suffusion rather thin, all the markings faint except the two costal spots. This description is from the type named by deNicéville but there are all sorts of gradations between this and typical *ransonnetti*.

Egg.—Is in the shape of a dome, slightly constricted at base, the sides perpendicular for some way up, then the somewhat flattened, convex top covered with white, fine, curly hair from abdomen of butterfly. There are some 17 or 18 meridional ribs from base to within a short distance of apex, low, rather narrow but distinct, surface between obscurely pitted, otherwise shining. Colour pinkish, ribs white. B : 1·3 mm ; H : 0·90. It is very like that of *Odontoptilum angulatum*.

Larva.—The body is more or less spindle-shaped, fattest in the middle, the anal segment longly semicircular and convex transversely, overhanging the anal claspers a little with a moderately strong, dorsal inclination ; all prolegs and legs short, the ventrum somewhat flattened ; segment 2 circular in transverse section, rather short, light orange in colour, the posterior half with a black collar that is narrowly interrupted in the dorsal line, occupying nearly the whole length of the half-segment and reaching down to just above the spiracle on each side ; *head* is broadly corate in shape, slightly depressed in the dorsal line down the centre of face, deepest on vertex : colour chocolate-brown : surface covered with long, minutely-feathered, curved hairs very densely disposed so as to hide the surface, white in colour round the periphery, a few black ones intermixed : shorter, similar hairs on the face inside the periphery, including the surface of the clypeus and the eye-areas : the eyes arranged, the uppermost 4 in a gentle curve, numbers 1, 2 very close together, nearly touching, numbers 3, 4 further away, 4 as far from 3 as 3 from 2 (about double the distance 1 is from 2), number 6 three times as far from 4 as 4 from 3, number 5 behind and forming a triangle with 4 and 6 but nearer 6 : all light in colour ; mandibles dark brownish-orange with the end quarter black along the cutting-edge, the cutting-edge itself practically quite entire ; the antennal, basal joint white, the second dark red-brown ; the ligula much broader than labrum, rusty red-brown or dark-orange, kidney-shaped, the sinus acute, triangular ; the labrum membranous-white, somewhat broader than long, the margins straight ; the false clypeus about half the length of the face, a broad strip (difficult to see) outside the true clypeus, triangular, the sides convexly curved outwards, the apex acute ; the true clypeus hardly one-third the height of the face, an equilateral triangle (both difficult to see being covered by the recumbent, heavily-feathered, greyish-white hairs) ; segment 14 as long as 12 ; segment 13 not quite half 12 in the dorsal line, becoming shorter though never on the spiracular region ; 11 one-fifth longer than 12. *Surface* of larva covered all over with small, white, conical tubercles each bearing a stout, short, white hair which is bifid shortly at the extremity, these tubercles disposed at a distance of one of their own diameters from each other or at a distance equalling one of the surmounting hair-lengths—which is one and the same thing ; the hairs along the dorsoventral margin simple and of the same length ; next to no hairs on the ventrum but the outer faces of the prolegs have both tubercles and hairs ; the usual, thin, parallel, depressed, transverse lines, four in number, in front of and parallel to the hinder margin of each segment ; the segmental margins showing thinly bluish. *Spiracles* of small size, greenish or greenish-white, those of segment 2 more than 2 × the size of the others, those of 12 perhaps slightly smaller than those of 2 ; all broadly oval, flush. *Colour* of body light-green with a yellow tinge which is sometimes quite strong, the segment-margins thinly bluish or greenish ; the ventrum a neutral tint of a very light shade—a kind of indigo. L : 28mm ; B : 4mm at middle which is also about the diameter of the head.

Pupa.—It is a stout pupa, in *shape* square at the fore-end, the head quadrate with a short, upturned frontal process pointing upwards, the shoulders rounded, broader than head, the body and wings slightly and shallowly, widely constricted at middle, the abdomen longly oval afterwards, coming to a point at anal end where there is a stout, oblong cremaster, somewhat longer than the frontal snout, this cremaster bent downwards in a slight curve and in a plane perpendicular to the longitudinal axis of the pupa, as thick as broad, ending square behind where it is ever so slightly dilated to accommodate the massed suspensory hooklets which are comparatively long and strong: the oblong portion of this cremaster only half of it, the anterior half widely triangular, constricted shallowly and sharply laterally where it joins on to segment 13, the common margin being quite a straight line; segment 13 quite as long as 12, slightly longer than the basal, triangular piece of cremastral segment, parallel-sided (the front margin, that is, parallel to the hinder); segment 12 equal in length to segment 11, both these segments having the dorsal slope at about 45° or slightly less to the axis—sometimes 13 and 14 only little more, notwithstanding that, occasionally, the actual cremaster is steeper; segments 10, 9, 8 all about equal to 11 except for their bevilled, hinder margins which adds about one-third more or even in excess of that, these bevilled margins smooth, satiny, rather steep, telescoping over their opposing front margins of 9, 10,11 which are shorter, steeper and somewhat more coarsely granulate-satiny; segments 7, 6 about equal each to 8; 5 rather shorter segment 4, very short in the dorsal line though long enough laterally because the hinder margin of the thorax is a very nearly semicircular curve; this curve meets, in its ends, the wing-lines at an angle of somewhat less than 90°, this angle deep, broadly rounded; the thorax is about as long as segments 5+6+7+8 together, is stout, rather highly convex longitudinally, more so transversely, its evenly-rounded apex situated about the middle although some two-thirds of its length is very nearly (the dorsal line or area) parallel to the longitudinal axis, the posterior end much steeper, the fore-end not quite as steeply inclined towards segment 2 which is lower, its front margin quite straight; segment 2 about as long as 5, its front and hinder margins parallel—coming to a point, meeting that is, of course, as usual at the antennal, upper outline, its angle of inclination to axis less than 30°; the *head* with the vertex rather broad between the antennal bases, the whole quite smooth though somewhat convex both ways, its dorsal slope forwards about the same as that of segment 2, the frons in a plane perpendicular to the axis, its whole breadth rising very gradually at first, then more rapidly into the basal cone of the "snout" alluded to above; this snout more or less cylindrical, slightly broadened at end, quite blunt, about as long as three-quarters segment 2, directed diagonally upwards, the portion of the frons below it sloping rapidly to the ventral surface, this frons abutting in front on two lateral, rather large, triangular pieces, one on each side—the basal joints of the palpi ?—and the bases of the two proboscis-halves; between these halves, in continuation of the frons, is a small, longly-diamond-shaped piece—the ligula ?—about 2 × as long as the base of the palpus is broad; the proboscis reaches the ends of the wings and is prolonged free beyond as far as the end of segment 10, lying closely pressed against the surface; the forelegs reach between one-third and half-way towards wing-end, the midlegs about two-thirds, the antennæ slightly less than these latter; the wing-ends produced at apices, the hind wing showing rather broadly beyond the fore wing, the ends of the hindlegs just visible, one on each side of the proboscis. *Surface* shallowly and somewhat distantly, although sharply punctate or pitted on the abdomen, shallowly, somewhat coarsely, closely-corrugated transversely and irregularly on segments 1, 2, 3; the wings minutely frosted, the veins, legs antennæ, etc., somewhat bluntly prominent; the frontal process coursely rugose, the cremaster less so, the former covered with very fine, thin, short, soft, light hair about half as long as its own breadth; the eyes with similar hairs; the whole body except wings (which are naked) covered with a down of well-separated (for such a thing as down), extremely short, soft, more or less decumbent, light hairs visible under the lens; the segments well-marked, somewhat constricted at margins on abdomen; the expansions of the spiracles of segment 2 very conspicuously prominent, orange, about three-quarters the length of the frontal snout. *Spiracles* of segment 2 with very conspicuous expansions of the dimensions just mentioned, nearly as broad as long at the top, shaped like deformed mushrooms, the stem very short, the head or umbrella deformed on the inside diagonally towards dorsum of thorax, the perforation whence it arises situated on the surface of segment 3, circular; the umbrella formed by numerous, closely-packed, stemmed hairs (?), the stems of which are shining and longest on the dorsal side, becoming shorter as they recede towards antennal region, the ends minutely feathery—the effect being the half-umbrella appearance; the rest of the spiracles brownish-greyish, the centres linearly light, the raised border with a fine dark brown or black line along its crest all round, all rather small, those of 12 not larger *Colour* of pupa very light yellowish-green with a white bloom over it, the wings; more colourless-green, shining; the abdomen ever so faintly yellowish; the thorax, segment 2 and head duller and more opaque-looking than the wings, the following black spots, all twice or three times the length of a spiracle at least, all more or less regular, more or less round:—the frontal snout, a spot on each eye-front, one on the palpus underneath (ventrally), one subdorsal on segment 2 up against the antennal base, one on each shoulder, one behind each spiracle-expansion of segment 2 and touching it, one, larger, dorsal, on front margin of segment 3 (just behind margin that is); one on the side of each eye, laterally; one well above shoulder and before middle of thorax; another laterally about two-thirds the length of thorax from front margin; one, generally very small, on dorsal line at hinder margin of thorax; one in each angle formed by its hinder margin and the wing-line; one, lateral, on each of the abdominal segments 5 to 12 and one, dorsal, on 13; segment 14 with the end of cremaster black produced along the dorsal line forwards; the wings have a spot at base behind the shoulder-spot and another ventrally behind and below the same spot, a line well inside the abdominal margin and, may be, a few more longitudinal lines; there is a spot surrounding each spiracle on abdomen and a line along each extensor-ridge ventrally on cremaster. L: 77mm; B: just over 5mm at shoulders; sometimes 20mm × 5·5mm.

Habits.—The habits of the larva are nearly exactly those of *Odontoptilum angulatum* in every way; the cell is made in the same way all the way through and the pupation takes place similarly and in similar places. The butterfly is a spasmodic flier, never going far and never rising very high from the ground; it is not found basking on the tops of trees (the males—for the females of butterflies bask rarely) and does not come to water; its flight is rapid and jerky in the manner of skippers; it occasionally visits flowers and is apparently rather impatient of very bright sunlight. It is an insect of foliage and jungles, not coming much into the open. It rests with wings wide outspread and never raises them over the back when sitting. It prefers, for purposes of rest, the undersides of leaves but may be found, also, in the daytime, on the uppersides, in the intervals of flight. The egg is laid on the upperside of a leaf. The young larva makes a cell by cutting a circular piece out of the leaf away from the edge, leaving a small hinge. This piece is turned over on to the top and there fixed all round except for a small place for egress; the inside of this cell is lined thickly with a carpet of silk and the larva rests on the lid, not on the leaf; that is, upside down. This lid withers and shrivels and turns brown, so it is easy to see. Later on, when grown big, the caterpillar makes a cell by turning over a large, triangular piece from the edge on to the top and fixing it down all round, the egress being next the hinge ; this it lines with silk and holes are eaten irregularly in the cover, mostly round the edges, leaving space for the larva to rest on in the middle. The change to pupa takes place in such a cell and the times of growth of larva and rest as pupa are normal although never rapid—indeed, sometimes the larval growth is rather slow. The foodplant is *Helicteres isora*, Linn., a low tree or shrub of the family *Sterculiaceae.* The butterfly is variable in colour, running from bright golden-brown above to dark-brown with few markings and many more markings respectively. The golden-brown form, generally the dry-season form, was called *A. taylori* by deNicéville.

Swinhoe says the type came from Ceylon ; that he has both sexes from Kandy and Trincomali ; also from Ootacamund in the Nilgiris, Kolar and Coonoor. Fergusson records it from Travancore, it has been bred in Karwar and is common in the Kanara District at all heights ; Evans got it in the Palni Hills ; Rhè-Philipe in Mussooree, Hannyngton in Kumaon ; Aitken at Igatpuri in Nasik District ; Swinhoe has it from the Khasia Hills.

Genus 6.—COLADENIA.

Swinhoe says (*Lepidoptera Indica,* vol. X, p. 61) :—

The venation of both wings similar to those of the genus *Tapena.*

Antennæ.—With the club moderate but thicker than in *Tapena* and with the acuminate portion shorter and curved but not hooked as in that genus.

Palpi.—Porrect, terminal joint short, obtusely conical.

Hind tibiæ.—With two pairs of spurs ; in the male with long tuft of hairs attached to proximal end except in *laxmi* and allies in which the hairs are in the form of a fringe along the inner side of tibiæ.

Fore wing.—Costa evenly arched, outer margin evenly convex, hinder margin nearly straight and about as long as the outer margin, apex acute.

Hind wing.—With the outer margin rounded.

For *egg, larva, pupa, habits* see below. Swinhoe says " We put *agni* and its allies into this genus, as Elwes and Edwards have done and not into the genus *Tapena* as Watson and deNicéville did, because the only character in which they differ from typical *Coladenia* is in the slightly different position of the hairs on the hind tibiæ which is a character insufficient to separate them into a new genus ; in all other respects : in the shape of their wings, in the pattern of their wings and in the form of their antennæ they agree with typical *Coladenia* and are very different from *Tapena thwaitesi*, the type and only species we know of belonging to this latter genus." Swinhoe has included *dan* in this genus but it fits *Sarangesa* better in every way and is hereafter put there.

206. Coladenia indrani, (*Moore*).—Wet-season Brood.—Male. *Upperside* : dark-brown. Fore wing, sparsely covered with ochreous setæ, especially at base and with three subapical, semihyaline dots in an oblique curve in interspaces

6, 7, 8 and sometimes a small one below in interspace 5; a discal series of four spots, the largest at the extremity of the cell which it fills, another much smaller outwardly below it in interspace 3, one more than twice the size of this last in interspace 2 a bit inwards and a small spot between the cell-spot and costa: all surrounded with blackish slightly; a dark postdiscal band, bending out at its upper end and including the subapical dots and has an orange spot on it at its lower end above inner margin and another similar, smaller, orange spot further in ; a submarginal row of orange spots beyond the band, the middle ones obscure, the apical ones sometimes also very blurred; a subbasal black spot in submedian interspace; the margin often also darkish, like the postdiscal band; blackish that is. Inner margin with a rather longish fringe of brown and ochreous hairs. Hind wing, covered with long, ochreous hairs that are thick along hinder half and a fringe of light-ochreous hairs along abdominal margin; a small, black subbasal spot below costa, a medial series of three blackish, similar ones in interspace 7, end of cell and interspace 1; a postmedial series of 7 blackish spots beginning in interspace 6 and ending in interspace 1 bordered by an orange submarginal band outside, the last two more or less geminate, occasionally hardly visible; the margin narrowly brown—the orange submarginal band sometimes obscure. Cilia of both wings brown, checkered white on hind wing, on fore wing white for a short space above tornal angle. *Underside*: paler with the markings as above but the black and orange ones much bolder, brighter.—Female like the male in every way with nothing to distinguish the one sex from the other on the wings. Antennæ light brown-ochreous on top, blackish underneath with the club black, the end part chestnut on top; palpi bright-ochreous with the tip of second joint and whole of third joint brown; head and body above concolorous with the wings; breast below ochreous, abdomen brown, the very middle of abdomen and segmental margins ochreous; in the female the anal tufts are drab of a light shade, of male bright-ochreous; the legs are pinkish light-brown; in the male the tuft on hind legs is blackish or brownish.

Dry-season Brood.—Male. *Upperside*: ocherous fawn-colour, varying a bit in shade in different examples, sometimes bright ochreous-fawn, sometimes tinged with brown slightly. In extreme forms there are no ochreous markings at all but the hyaline spots are the same as in the wet-season insects and the black spots are never absent and this remark applies to the uppersides as well as undersides. Expanse 40mm: often less.

In many of the bred Kanara specimens, and there have been hundreds of them, there is a decided tendency to a sinuation between veins 4 and 6 of the hind wing on the outer margin; in a few of the dry-weather specimens the sinuation is not only actually there but it is strong in some of them.

Egg.—Dome-shaped, rather depressed, broadest at bottom however; the surface shining and finely pitted all over besides being sculptured by having 16 meridional ribs from base to top, losing themselves before or just as they reach a ribless circle 0·45mm in diameter occupying the top of the dome; these ribs are quite fine, 0·2mm from each other at base of egg, the rib hardly 0·025mm thick and gradually rising from surface. The colour is, as far as memory serves, of a green shade with the ribs whiter; and there are always some scales from the abdomen of the female on it, sometimes covering the surface, sometimes only a few. H: 0·5mm or 0·55mm; B: 1mm exactly. It is generally laid, always one at a time and not often more than one on the same bush, on the upperside of a leaf and the leaf chosen is almost always an old one or a fully mature one, one for preference eaten into holes and sinuses by other insects, leaving nervure-ends, little pre-eminences of leaf-surface and withered ends of nerves upon the tips of which the egg is deposited. They are hardly ever laid on fresh tender leaves, these eggs and the little larva always prefers old leaves for food.

Larva.—The body is in shape spindle-shaped, thickest in segments 4, 5; ventrum flattened, legs and prolegs short; anal segment overreaching the anal claspers, semi-elliptical in shape, thickened slightly round margin, rather square at extremity; segment 13 distinct, half the length of segment 12; segment 2 with the front half slightly incrassated into a collar which is white in colour; the neck quite distinct; the head well separated, larger than segment 2 in diameter, though not large for the larva. *Head* nearly round, thick, with a deeply impressed, narrow line over vertex down centre of face, most deeply on frons dividing it into two lobes with broadly rounded vertices; the true clypeus triangular, half the height of face, higher than broad; the false clypeus hardly distinguishable, triangular, the apex broadly rounded; the whole surface minutely and coarsely reticulate-rugose including the false clypeus and, in a lesser degree, the true clypeus also and covered with many, minute, very short, white star-topped hairs only visible under the lens and some slightly longer, reddish ones about the mouth; labrum glassy, transverse; ligula large, kidney-shaped, brown; basal, antennal joint brown, the second joint redder brown; mandibies red-brown with black tips; the eyes black, the four of the curve being all equally spaced; the colour of the whole head shining black or deep red-brown which is practically black. *Spiracles* very slightly raised, circular or nearly so, light brown in colour with a double, thin, darker margin; that of segment 2 hollow, funnel-shaped, very large; that of segment 12 a good deal smaller. *Surface* of body dull, smooth to the eye; covered all over with minute, erect, white, short, star-topped hairs like the head but, perhaps, not so densely; the hairs on the margin of segment 14 being somewhat longer, reddish; there are some simple, erect, short, white, pointed hairs on legs and prolegs; a minute, circular, glassy, dorsal lateral dot on segments 5-12 which is placed somewhat in front of the middle of segment; a larger, lateral, similar, oval dot on segments 3, 4; a similar, oval, glassy dot below each spiracle and one on the ancle of each foot of prolegs. The *colour* of the body is greenish russet-brown, with a moderately plentiful sprinkling of white dots all over it; ventrum bluish green. L: 24mm; B: 5mm.

Pupa.—The pupa is of ordinary *shape* except for the large frontal process and the large, golden-orange, plush-like faces to the spiracular expansions of segment 2. It is squarely blunt in front—except for this frontal, knob-like process—and bent down and pointed behind; there is a slight lateral as well as dorsal constriction at segments 4, 5, where the body-string passes; the wings are somewhat produced at apices and the proboscis further still, being free nearly up to the end of segment 9; the segments are well marked, the bevils of segments 9, 10, 11 also; segment 13 is half the length of segment 12 and is shaped like a half-bowl—the ventral half being wanting—with a deep, narrow, round-ended sinus in dorsal line at front margin; segment 14 a similar, smaller (in diameter) half-bowl, also with a similar sinus, the apex continued into the shortly oblong, thickened, rugose, slightly down-curved cremaster with the hooked supensory, golden-orange shafts bunched at the extremity. The frontal knob of *head* is at the front end of the pupa sticking straight out in continuation of the longitudinal axis, is somewhat lengthened, thickened at end, constricted at base, rugose as to surface and with rather long, erect, golden-orange hairs—the head is bowed, ventral; the frons is in a plane perpendicular to longitudinal axis of pupa; segment 2 at an angle of 35°, a broadish band; the head vertex at an angle of 45°; both margins of segment 2 straight; the front slope of thorax at an angle of 30° or slightly more, the curve, then, quite even and smooth, running up to the thoracic apex and down again to hinder margin which is a quarter-circle curve (or slightly more) meeting the wing lines in a widely open, rounded angle of somewhere about 90°; the thorax is humped moderately. The *spiracles* of segment 2 are indicated by large expansions rising from the front margin of segment 3 in a short "foot" to a small convex surface which faces forwards, is shaped like three-quarters of a circle and is covered with a golden-orange shining plush; the rest of the spiracles are slightly raised, rather small ovals, the colour of the body. *Surface* of the body is shining, covered all over fairly densely with short (much longer than the larval ones), more or less simple, erect golden-orange, simple hairs; these hairs tufted on each side of each eye-ridge and round each proleg-scar ventrally. *Colour* of pupa light brown-yellow on abdomen; darker brown on thorax, head and segment 2; redder on wing cases, nearly black on cremaster. L: 17mm; B: 5mm.

Habits.—When just emerged from the egg, the little larva cuts out a circular piece from the middle of the leaf somewhere and turns it over on to the top—it is a small circle of about 4 or 5mm in diameter—and turns it over on to the top of the leaf; this little circle withers and becomes concave underneath; the little larva fixes the bit all round with silk so that it lies closely applied and coats the inside above and below with silk thickly; it leaves a semicircular opening in front which it enlarges as necessity demands; it goes some distance to feed, always returning home. When too big for its first home, it turns over a bit of the leaf from the side—a triangular bit—and makes a new one. When full grown it gnaws nearly through the midrib, eating from the place where it does so to the edges of the leaf on either side, thus more or less separating a large portion of the top of the leaf from the basal part so that the top part hangs down; this hanging part it makes into its final home by turning over a large, wide-based, narrow topped (triangular) piece on to the remaining surface and fixing it down lightly, leaving an aperture (round) in front towards the base of the leaf; it, at the same time, webs the cut-through part of the midrib to prevent it ever falling away to the ground. This hanging part withers and becomes dry and shrivelled; the inside of the cell formed is covered thickly with a coating of silk which makes it into a very tough cell hard to tear open. After eating largely, it finally turns into a pupa inside the cell and attaches itself by the tail and a body-band, the body-band being again fixed to the top of the cell by a single silk. Some of the specimens took 2 months to grow from the egg to the pupa. The pupal stage is of normal length, *i.e.*, of 10 days. The imago emerges in the morning, rather late and expands its wings quite quickly, flying within an averagely short time. It rests with the wings fully opened and flies well and strongly. It settles on the tops of leaves and is commonly found at flowers—*Allophyllus*, *Lea* and such-like—and always with the wings fully open. It is moderately fond of sunlight but is an insect of the regions of heavy rainfall more than of open places and dry country. It is a common insect on the Western Ghats in Kanara and Belgaum where its foodplants are found: *Xylia dolabriformis*, *Grewia microcos*, *Mallotus philippensis*, *Desmodium*, *etc.*, belonging to the families of the *Leguminoseæ*, *Tiliaceæ*, *Euphorbiaceæ*—and there are certainly others also.

Colonel Swinhoe, under Habitat and Distribution gives "India, Ceylon, Burma. The type is marked Bengal; we have many examples of both the wet and dry season forms from Sikkim, Assam, Madras and Karwar and have examined many other from various localities; it is a common species throughout India and Burma; the *uposatha of* Frhstorfer is the extreme dry-season form; our figures of the larva and pupa are from Davidson's drawings not previously published; we have examined the examples in his collection, they are all marked "rains," all have checkered *cilia* and are not *tissa* but the wet-season brood of *indrani.*" (*Lepidoptera Indica,* vol. X, p. 65). This is all correct.

(*To be continued.*)

OUR REQUIREMENTS.

The Society would be very much beholden to any members who would be good enough to send in female specimens, freshly captured, of the following skippers (*Hesperiadæ*) :—

Particularly any *Halpe* and *Arnetta vindhiana.*

Also any of the following genera :—

Rhopalocampta, Ismene.
Capila, Calliana, Achalarus, Hantana.
Daimio, Satarupa, Tagiades, Charmian, Odina, Gerosis, Ctenoptilum, Darpa.
Hesperia, Pyrgus, Carcharodus, Thanaos.
Pamphila, Ochus.
Lotongus, Zela, Hidari, Pirdana, Œrane, Creteus, Pithauria.
Pithauriopsis, Pesdestes, Suada, Isma, Scobura, Itys, Sebastonyma, Zographetus.
Gegenes, Iton.
Erynnis, Augiades, Onryza, Actinor.
Acerbas, Tamela, Koruthaialos, Watsoniella.

The object in view is a study of the eggs which can be dissected out from the bodies. So it matters little if the insects are damaged—as long as they can be recognized for what they are. Many captures are thrown away by collectors as being "bad specimens" which would be very useful for the purpose above mentioned.

A JOURNEY TO SIAM AND BACK

BY

MAJOR C. H. STOCKLEY, D.S.O.

PART III.

(*With* 2 *plates.*)

(*Continued from page* 387 *of this volume.*)

While staying with Mr. Gairdner, I came on an article in the Journal of the Natural History Society of Siam, written by Mr. P. R. Kemp on Schomburgh's Deer and on reading this my hopes of obtaining one were shattered. It appears that this deer is no longer to be found in the Paknampo area, but is now restricted to a small and unexplored tract far to the east.

The season was too advanced to think of getting there, or of making entirely fresh arrangements for transport, etc., so I had to look round for a new line. Here Mr. Gairdner helped me by suggesting the Mewong Valley, which had a good reputation for big game, and it seemed that by crossing from the Mewong to the Upper Meklong and thence to the Upper Thaungyin, I would be traversing country of very great interest, both geographically and zoologically. I therefore decided to travel down to Paknampo by river with Gairdner, and rail from there to Bangkok, where I would refit, and then return to Hkambengpet (about 60 miles south of Raheng) which was to be my starting point for the return land journey. Before leaving Raheng Gairdner kindly helped me to fix up pony transport to meet me at Hkambengpet.

Raheng was a bad place for mosquitoes, owing to the swamps which lie to the east of the town. A few thamin still survive a day's march to the east, and I saw three heads in the Raheng bazaar. There are a great many guns in Siam and game has little chance near the populous cultivated tracts along the main rivers. These tracts are inhabited mainly by the true Siamese, the dense forest at the back of them being peopled sparsely by Karens.

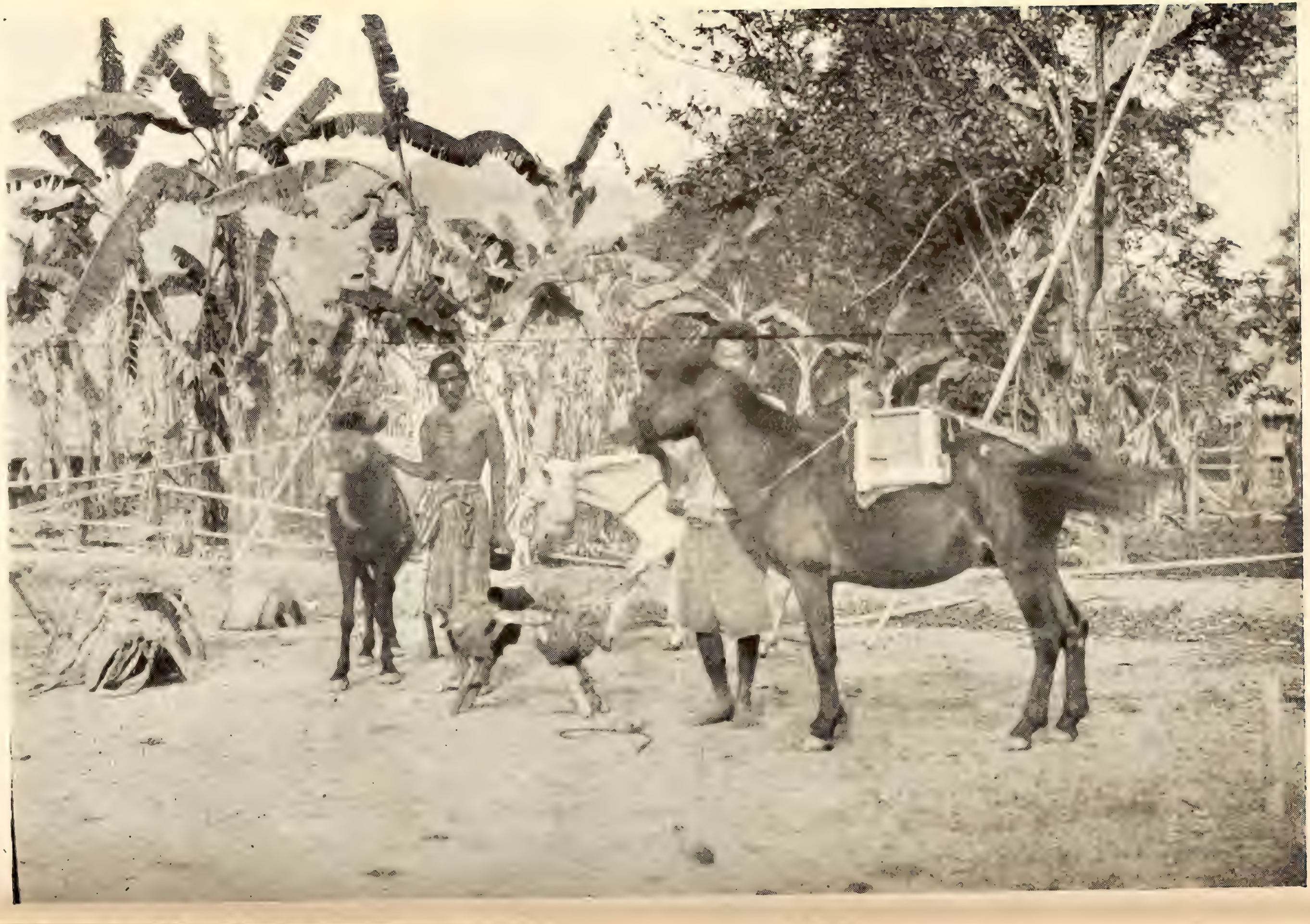
The Siamese have a curious way of wearing their hair standing straight on end like a large blacking brush, and they have also a habit of blackening their front teeth. As they are by no means distinguished by beauty of feature, the *tout ensemble* is not usually prepossessing at first sight. They are however a pleasant people to deal with, and their officials seem to know their job, and were extremely kind and helpful to me.

On March 5th, we set forth down the Meping in three boats, the third being the cookboat. The river was so low that we had to use small boats, with an arch of matting for a roof. Maung U, as usual, had been patronising the local pubs, and spent most of the first two miles swimming behind us, in order to cool his head.

The boats were paddled gently with the current or poled over the shallows, and we reached Paknampo on the 12th, passing Hkambengpet on the 8th. The whole journey was like a continuous panorama of a waders' aviary. Herons were on every sandbank, either the common, night heron, or paddy bird ; while once I saw a very large bird which I took to be the Giant Heron, (*Ardea gigantea*), but was unable to get sufficiently close to make certain. Terns of three species, Black-naped, Black-bellied and Indian River, floated and wheeled gracefully over the hallows, or occasionally followed the boats for scraps, while Spur-winged Plover screamed monotonously the whole length of the trip. Egrets, large, small and middle, patrolled the edge of the water, sat in flocks on trees, or perched on bathing buffaloes ; while the enormous red bill of the Stork-billed Kingfisher was conspicuous every hundred yards or so on some overhanging bough,

Meping River at Raheng.

Paknampo showing Floating Houses.



Upper portion of pack-saddle on ground. Load is strapped on to this frame and then lifted on to pony's back. Legs of frame fit his relations, the Pied, Common and White-breasted, hovered, plunged and sat on snags. Darters and Cormorants were common, while Ospreys added their incessant clamour to the noise of the Spur-winged Plover. Other Raptores were the White-headed Fish Eagle, Brahminy Kite, Pied Harrier and Hen Harrier. The Common Kite seemed comparatively scarce.

Along the edges of the sandbars Greenshank, Dotterel, Godwit, three species of Sandpiper, and Pratincoles ran busily about searching for food.

On the first evening we landed on a sandbar to pitch camp, and while pursuing a godwit, I put up and killed a snipe. On picking up the bird I was surprised to find that it was a fantail, and not a pintail as I had expected.

In the evenings the harsh call of the Chinese Francolin or the melodious whistling of green pigeon was usually to be heard close to our bivouac, while the report of a gun would set all the White-breasted Waterhens braying for miles along the river. Gairdner told me that the Siamese say that these birds call the watches of the night: they certainly produced their weird call at most unseemly hours.

It was at Raheng that I was first introduced to the sapodilla, whose fruit is popular in the U.S.A. I thought them excellent, and was glad to find that they were obtainable in most big villages along the river. We also occasionally bought a fish, usually lanchi or goonch, but occasionally, when lucky, we got a murral. A couple of Green Imperial Pigeon were the only game birds I shot; even jungle-fowl were scarce by the river.

Any thing for the pot was always welcome, as the Chinese were celebrating their New Year and there were few fowl or other supplies to be obtained. The Chinese put up the cost of living wherever they settle and they are fast getting the trade of Siam in their hands. They live in filthy huts on ground level with pigsties built against them, and not in huts built on piles as do the comparatively clean-living Siamese and Burmans.

It was interesting to note the types of large boat on the Meping. The Siamese type has a straight keel and lines, but is being rapidly replaced by the Chinese type which is built on curved lines modelled from the body of a duck and known as "duck-boats." The Chinese type carries as much cargo for the same draught, and, as it is much easier to work over the shallows, it can ply much later in the dry season than the Siamese type: it has also the unpractical advantage of being much more graceful to look at.

Another thing I noted was the large proportion of pink-skinned china-eyed buffaloes among the herds bathing in the river. In some herds these albinesques must have formed a third of the total.

Paknampo was an interesting place, as it is situated at the confluence of the Meping and Me Nam which thereafter become the Menam Phraya, and is the centre of the rice trade of Upper Siam. Most of the rice from Northern Siam is rafted down the Meping to Paknampo and there sold to Chinese merchants for export. This export rice is not that eaten by the Siamese themselves; they consume a kind which becomes a semi-transparent, glutinous mass on being cooked. Below Paknampo lies the great rice-producing plains of Central Siam which are annually flooded to such a depth that the rice grows on a stalk 12 to 15 feet long, in order to keep its head above water.

At Paknampo many of the inhabitants live in floating houses, which are moored by large iron rings to fixed poles, so that they rise and fall with the level of the water.

I was much struck with the large coils of rattan stored in the Bombay-Burma Co.'s compound, where I enjoyed the hospitality of Mr. Seaton Smith. These rattans are collected during the dry season in preparation for the rafting of teak logs, which commences with the rains. Shortly before they are to be used these rattans are put into soak and are then used to bind the logs together into rafts.

I left Paknampo by train on the 14th, reaching Bangkok the same evening. The engines on this line burn wood with considerable effusion of cinders, to the detriment of the cushions and other fittings of the carriages. They are also the cause of considerable merriment to the passengers when a cinder falls down the back of some fellow traveller's neck.

The country we traversed was flat and uninteresting, and little was seen worth comment. I noticed that all the egrets were getting their nuptial plumes, though those further north had shown no signs of acquiring them. One thing I noted was that in two different places a couple of Siamese, armed with iron rod and spade, were probing and digging for aestivating murral in the borrow-pits by the side of the railway: a method of capture I had previously thought to be confined to Burma.

Bangkok was a great surprise. It is a city of wide streets and motor roads; good shops and wide canals. The whole city seems well laid out, and I was told that nearly all the revenues of inland Siam are applied to the upkeep and improvement of Bangkok, which contains three-quarters of a million inhabitants.

Mr. Hamilton Price of the Bombay Burma Co. very kindly put me up, and during my three days' stay I met several enthusiastic and highly competent naturalists, who run a flourishing Society. I handed over to Mr. Herbert, who has made a particular study of the local pheasants, the cock *Gennaeus* which I shot at Pang Yao, together with another shot by Mr. Gairdner. Unfortunately time did not permit of a more than cursory look at Mr. C. Williamson's fine collection of birds, while an afternoon spent with Mr. Godfrey, who is *the* authority on the butterflies of Siam, only made me want several days with his collection. A visit to Dr. Malcolm Smith was both interesting and profitable: he always has a number of reptiles, alive and in spirit, which are well worth seeing; but he also has some very interesting heads of Thamin and Schomburg's Deer. He most kindly presented me with a grand specimen of the latter species; a handsome, even, 22 pointer. When lunching with General Stevenson, our Military Attache, I was much interested in a tame White-handed Gibbon, a fully adult male which seemed a gentle and pleasant pet. He was black, as I think are all old males of this species. He seemed disinclined to adopt an upright attitude, but did so when offered Miss Stevenson's hand, and walked about with her. He had been in captivity some years.

The only thing I personally saw of zoological interest in Bangkok at first hand, was an Elephant Trunk Snake, which was lying dead on the bank of a canal, evidently recently killed by some boatmen. It was large specimen, fully six feet long, of the colour and thickness of an elephant's trunk.

In making preparations for my return journey, I was greatly assisted by Mr. P. R. Kemp, head of the Siam survey, who provided me with a map of the Mewong which proved most useful. Mr. Kemp has made a study of Schomburgh's Deer, and I was most interested in what he had to say on the subject.

I returned to Paknampo on the 17th March, and found it much hotter than when I had left, it being 98° in the bungalow at 4 p. m.

I left Paknampo on the 19th in two of the same boats in which we had come down river, and camped some seven miles up stream that evening. As the boats travelled slowly against the current I had plenty of time now to do a little collecting. The first thing I noticed was that the Golden-backed Squirrels seemed much larger and to be much more richly coloured than those I had seen in the Thaungyin, and a fine male, which I shot on the second day, had the yellow of the back extending over a much greater area than any I saw or shot in other localities. Half way to Hkambengpet I began to see Giant Squirrels (*Ratufas*) and shot three of these fine squirrels to the detriment of romance, for two males were competing for the hand of one female, and the chase ranged all over a grove of giant evergreens. Fish were also interesting, as the boatmen caught a 15 pound lanchi in a cast net, while I found a couple of Siamese fishing with rod and line, and with a goodly pile of fish up to three or four pounds in weight beside them. On examining the fish I was surprised to see that they appeared identical with the Carnatic Carp of India, which I did not think existed outside that country. On looking further into the matter I found that the bait was a long, green lanceolate leaf; and as I had memories of catching Carnatic Carp with this very bait in Southern India, the evidence of identity seemed fairly conclusive.

I was very interested, on nearing Hkambengpet, to notice that in nearly every village on the right bank, there was a small, penthouse-roofed, wooden structure containing votive offerings; and that in every one were skulls of *Crocodilus siamensis*. As these reptiles do not live in the Meping itself, and apparently do not like running water, I enquired whence these skulls came, and was told that there is a marshy lake about 20 miles to the west, which holds a large number of these reptiles. This information was confirmed later on by Siamese and Karens in different places after I left the river, and I hope to visit this lake soon and establish its existence. At present it is not shown on any maps.

There was no great variety of butterflies to be met with along the river: *Papilio nomius swinhœi* being one of the commonest, particularly affecting damp channels near the river banks. A few Pievids, such as *Nichitona xiphia*, *Terias harina*, and *Huphina nadina* were also very common.

A small *Tamiops*, (which takes the place of our Palm Squirrel but is not nearly so common) and a couple of Black-backed Squirrels were added to the bag. The Black-backed is very quiet compared to his relative the Golden-backed Squirrel. I found the males of the latter species to be quite as noisy as the Giant Squirrels, and on detecting the approach of an enemy they made a noise like a very loud pain of castanets. Though these squirrels chattered a good deal they could not compare with *C. caniceps* in the matter of voice production.

My boats had to be poled all the way up, as the forest came right down to the water's edge and prevented towing. In some places we had to push and haul over sandbanks, and we passed several of the larger river-craft struck fast and their crews digging a channel with boards.

Every evening I bivouaced on a sandbar, and tried to locate the eggs of the Spur-winged Plover, which wheeled and screamed about me, sometimes shamming a broken wing. I never succeeded however.

One evening, just after we had tied up , a boat approached down-stream and I was surprised to hear two verses of "Ta-ra-ra-boom-de-ay" sung completely through. As I had never heard anything but the chorus before, I was interested to find that the songster was a Burman trader. I was still more interested to find that this was the only English he knew!

I made enquiries all the way up as to the existence of Thamin and Hog-deer in the vicinity. All reports agreed that there are now none on the right bank, but that both exist in scattered localities a day's march to the east. I met a Chinese boat coming down with the skulls of two recently killed Thamin stags. One of these showed considerable palmation at the ends of the horns, and was the only really palmated specimen I saw from the Meping. The other head showed only a slight flattening of the ends of the beam. I purchased the palmated pair, which measured 31 inches; the other pair were an inch longer. Thamin heads from Siam do not run nearly as big as those from Burma, and these two were quite good for the locality. The Chinese buy the horns for medicine-making, and are mainly responsible for the reduction in numbers of thamin.

I never saw a head or skin of a Hog-deer in Siam, but was assured of their existence.

Except for an occasional jungle-fowl, Chinese Francolin were the only game birds. They called from high up in bamboo clumps by the river-bank in the early morning, and I never heard them call from the ground, though I frequently surprised them in the act. This coincides with their habits where I have met with them in Burma, but there they seemed to call more in the evening, and I found them much more plentiful in the scrub and small tree jungle of Thamin ground than in the main forest, even in the foothills.

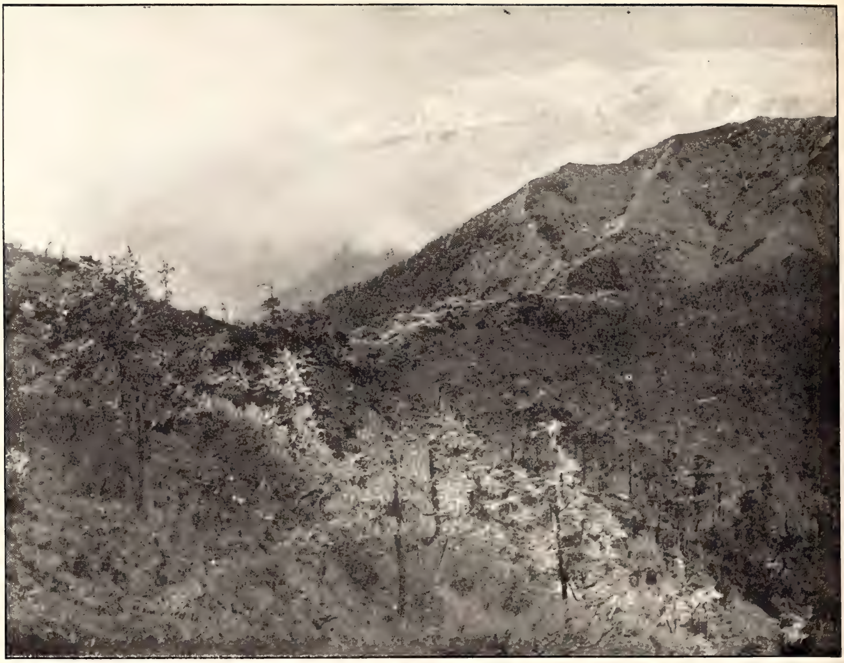
Green Imperial Pigeon were fairly plentiful and their loud "Moo" frequently, gave away their position, so that a careful stalk resulted in their figuring on the breakfast-table next morning. Fruit pigeons were scarce; a female Cinnamon-headed being the only one I actually shot by the river, though I saw several more of this species flying through the jungle at great speed.

We reached Hkambengpet on March 26th and stayed in a big "salah" or monastery on the right bank of the river. The town is on the left bank and comprises the usual gaol, gendarmerie post and other official buildings, with a long one-street bazaar. My ponies, 14 in number, turned up the next evening, and a sorry lot they were. I reckoned that only two of them could carry a 120 lbs. load, while the loads ranged downwards to as low as 35 lbs. This was a set-back, but I did not intend doing long marches, and hoped for the best.

I called on the Governor, a most voluble little man, who seemed to think my projected journey was a form of suicide. He and his myrmidons assured me that I would never get ponies over the Mewong-Meklong divide, but as they had never been there, and the man who had (a Burmese trader to whom Gairdner had introduced me) assured me that it was possible though difficult, I refused to be worried.

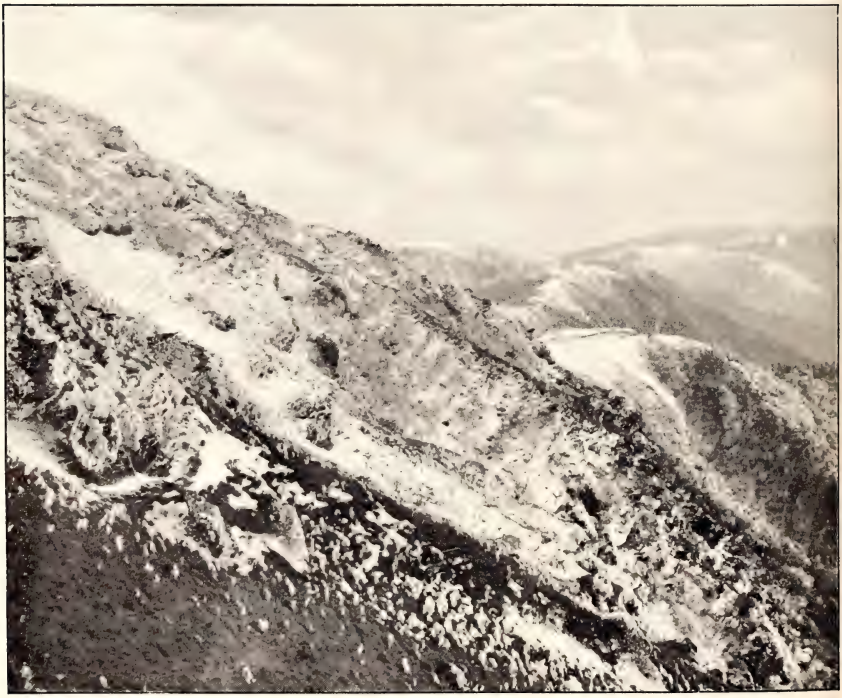
In the end though most of the ponies got over, some did not, and one remained permanently on top of the divide.

(To be continued.)



H. S. Photo.

SINGILE LA, 12,126′, AND EVEREST.
From Phalut, 18th February, 1912.



H. S. Photo.

PHALUT SUMMIT, 11,811′.
18th February, 1912.

NOTES ON THE BIRDS OF THE SIKKIM HIMALAYAS.

By

HERBERT STEVENS, M.B.O.U.

Part II.

(*With three plates.*)

(*Continued from page* 518 *of this volume.*)

FAMILY—PARIDÆ.

14. The Indian Grey-Tit. Parus major cinereus (Vieill).

Recorded for the Himalayas at all altitudes up to 9,000′ or more according to Oates. This distribution is entirely erroneous for the Sikkim Himalaya. I have failed to locate this Tit even at the lowest limits; it may have some status in the Tista Valley at elevations approaching the plains-level; all efforts to prove this conjecture have been to the contrary, and so far it has only been obtained at the *foot of the hills in more or less open country* at 500′ by Mr. G. E. Shaw. I suspect the heavily forested tract along the foot-hills demarcates its distribution more effectively than any appreciable rise in elevation is likely to affect any extension at dispersal, and this appears to be the case on the north frontier of Assam; also *P. monticolus* is a predominant species and the two Tits have well defined breeding distribution areas. Unless there is an overlapping in its eastern limits with "*commixtus*", *Parus major tibetanus* Hart., which occurs in the Chumbi Valley in Tibet may well be a good species.

15. The Green-backed Tit. Parus monticolus monticolus (Vig.) "Chichin Kothi," Paharia.

Oates states it appears to be found chiefly from 4,000′-8,000′ in elevation. In the Eastern Dooars, January 1922, I found it in small parties in forest at the base of the hills at almost the *plains-level.* Bhotan Ghat, Raidak River, ♂ ♀, 26-1-22. Mr. N. B. Kinnear has shown me a specimen recently obtained by the 2nd Mt. Everest Expedition at 12,000′ *in summer* from the Chumbi Valley in Tibet, and there can be little doubt this species is extending its distribution limits. Dikchu, Tista Valley, 2,150′, 22-2-20* and 13-3-20,* and at a somewhat lower elevation to the south of this place, to even 8,800′ in Lachung, where I saw a pair *in the winter*, 28-2-20.*In Gangtok at 5,800′, 21-2-20* I observed this Tit to be gregarious for the first time in large parties of fifteen to twenty birds composed entirely of this species, foraging on the ground. It breeds commonly in the Rungbong Valley from 4,000′-5,000′ in April and May; clutches sometimes number seven eggs (4-4-18).

Ten specimens examined:

♂ Wing 65-67, av. 65·9. ♀ 63-64, av. 63·3.

Soft parts: Iris, hazel; bill, horny-black, tip and edges of lower mandible lighter; tarsus, plumbeous-blue.

16. The Red-headed Tit. Ægithaliscus concinna iredalei (Stuart Baker).

Strictly sedentary. Occurs at elevations of from 5,000′-7,500′ *on the Outer Ranges*, not moving to any appreciable extent below its lowest limits in the cold weather. In the *Interior* observed above Chungthang in the Lachung Valley on the 11-3-20* at an elevation of 6,000′. Around Singhik at 4,600′ on the 12-3-20* and between Singhik and Dikchu in the Tista Valley on the 13-3-20* at an elevation of 3,500′. Mai ("Khola") Valley, East Nepal, commonly occurs from 6,000′-7,000′. The distribution as stated generally from 6,000′-10,000′ is, in the latter instance, undoubtedly too high an altitude for the Eastern Himalayas as it does not overlap in its distribution with *Æ. ioschistos.* Gopaldhara, 4,720′, 16-7-21* a pair of these Tits amongst a large party of small birds composed of *Phylloscopi, Zosterops, Certhia discolor* (pair), &c., &c., searching the trees around the compound daily, particularly bad weather; this elevation at this time of the year being considered worthy of record.

Nine specimens examined;

♂ Wing 47-51; av. 49-8. ♀ 46-49.

17. The Rufous-fronted Tit. Ægithaliscus ioschistos (Hodgs.).

This charming, diminutive species shares in all the varied actions of the true Tits. It seems to be impervious to cold and its copious plumage is significant of this fact. It is *generally distributed* at elevations of from 9,000′-10,000′, and rarely descends under stress of weather except perhaps evading the heavy snowfalls in winter, when its zonal distribution is modified from 8,000′-9,000′, and then may be found in small parties of eight to ten individuals, otherwise only in pairs in April, May and onwards. Kalo Pokhari, Nepal side of the Frontier, 9,500′, ♂ ♀ 12-4-12. Sikkim side of the Frontier, 10,000′, ♂ ♀ 18-4-12.

♂ ♀ 27-4-12. One pair also observed at 10,000′, 19-5-12.* Partial to Rhododendron forest (below the belt of the pines at the breeding season). Blanford states "probably only pine forest" where he met with it on two occasions only in the autumn: Lachung Valley at 10,000′, Lachen Valley at 9,000′. My own experience is that birds give the pine forests a wide berth if they can obtain sustenance in other more favourable haunts. It occurred around Karponang in the winter, 9,600′, ♂ ♀ 24-3-17. Lachung, common around 8,800′ and lower, from the 25th of February to the 11th of March 1920, frequenting light trees, bushes and scrub-growth adjacent to the river; *absent from the pine forests which were practically devoid of all insect and in consequence bird-life,* a single pair at an extreme, high-winter limit of 9,500′, 28-2-20.*

Eight specimens examined:

♂ Wing 55-60; av. 56·8. ♀ 56-57; av. 56·7.

Iris, naples (dark lemon) yellow.

18. The Yellow-browed Tit. Sylviparus modestus modestus (Burton).

Sparingly distributed, yet locally common. *Found from an elevation of* 6,500′-9,500′. On one occasion obtained at Gopaldhara at 6,000′, ♀ 26-12-20, and a probable record for Singhik in the interior of Sikkim, at 4,600′, 24-2-20.* Lachung, 8,600′, ♂ 27-2-20, a few birds noticed. Kalo Pokhari, 9,500′, several obtained in March and April, 1912. Senchal, 7,500′, ♂ 7-2-17. Semana Basti, (below) at 6,500′, 8-2-18.*

Easily overlooked and most difficult to locate owing to its insignificant size and dull green plumage, as it haunts the tops of the trees when in leaf, at times it may be seen amongst low tree-growth. Oates describes a ring of feathers round the eye yellow, edge of wing and the under wing-coverts bright yellow; these colours are absent in my specimens which would be more aptly described as greenish-white: in one example, ♂ 18-3-12, the edge of the wing hardly showing any imperceptible difference in colour to require notice.

Seven specimens examined:

♂ Bill from feathers at base 5-6·5, av. 5·9; wing 58-64, av. 60·6.

♀ Bill 6-6·5, av. 6·3; wing 55-58, av. 56·5.

19. The Indian Black-spotted Yellow Tit. Machlolophus spilonotus spilonotus (Blyth).

Sparingly and locally distributed. Resident at as low an elevation as 4,700′ *in the interior* of Sikkim, (Singhik, February, 1920). Found generally at 6,500′-8,000′, *on the Outer Ranges.* The elevation of 3,000′ as stated by Oates, is in need of revision, as it is far too low a limit for the Sikkim Himalaya. Observed near Ghoom at 7,200′, 17-1-17.* A pair obtained in the Mai. ("Khola") Valley, East Nepal, 28-3-12, at an elevation of 8,000′ approx., also, a ♂ and a ♀ obtained on the 27-4-12, at 7,000′ approx. Soft parts: Iris brown; bill dark plumbeous-horny; tarsus bluish-plumbeous.

20. The Sultan Tit. Melanochlora sultanea sultanea (Hodgs.).

Confined to the hot, steamy valleys. Commonly occurs in the Tista Valley at *low elevations* up to 2,500′ at Dickchu, 23-2-20*. A small party once observed in the Rungbong Valley at 3,500′ in January 1912, denoting an upward movement.

21. The Himalayan Cole-Tit. Lophophanes ater æmodius (Hodgs.).

Resident throughout the *winter at high elevations along the Singile La Ridge.* Commonly occurs from Tonglo to Phalut at 10,000′-12,000′, from January to March, and numerous around Kalo Pokhari at 10,160′, in April and May, similarly on the Nepal-Sikkim Frontier. Karponang, 9,500′, in March 1917. Lachung, 8,800′ observed in *February* and *March* 1920, seeking food amongst the scrub-growth around the village in severe weather. Blanford records it as less common than the other two species, but far from rare in the pine forests with a similar distribution.

Five specimens examined:
♂ Bill from feathers at base 7; wing 58-60, av. 59.
♀ Bill 7; wing 55-58, av. 56·7.

22. The Sikkim Black Tit. Lophophanes rufonuchalis beavani (Blyth).

Resident on the Outer Ranges with a *similar distribution in elevation as L. a. æmodius,* but more plentiful. Tonglo, 10,000′, January. Kalo Pokhari, 10,160′, March, April, May. Occurred around Lachung at 8,800′ in *February* and *March* 1920, being driven with inclement weather into the village. Blanford records it as by far the commonest Tit in the pine forests of Sikkim, both on the Cho La Range and in the northern valleys.

Nine specimens examined:
♂ Bill from feathers at base 9-9·5, av. 9·1; wing 67-72, av. 70.
♀ Bill 9-10, av. 9·3; wing 64-69, av. 66·5.
Soft parts: Iris dark brown; bill horny-black; tarsus plumbeous.

23. The Brown Crested Tit. Lophophanes dichrous dichrous (Hodgs.).

Commonly occurs as a *resident on the Outer Ranges from an elevation of* 9,000′-12,000′. Less numerous in the interior of Sikkim where I have noticed a marked disparity of its numbers compared with the other Cole-Tits.

Parties of this Tit, *L.a. aemodius* and *L.r. beavani* seen on numerous occasions, occupied taking food on the ground amongst the snow, particularly when foraging between dwarf rhododendron and birch on the mountain slopes and summits in January and February. I did not observe it in the Lachung Valley in February and March 1920. I may also have overlooked it in taking down my notes at Karponang in 1917. Blanford records it from 8,000′-13,000′ (August, September), northern Sikkim.

Six specimens examined :

♂ Bill from feathers at base 8-9, av. 8·5 ; wing 71-74, av. 72·5.

♀ Bill 7-8, av. 7·4 ; wing 67-70., av. 68·8.

Soft parts : Iris red-brown ; bill horny-black ; tarsus slaty-plumbeous.

FAMILY—PARADOXORNITHIDÆ.

24. The Great Parrot-billed Babbler. Conostoma æmodium (Hodgs.) "Tuti" Paharia.

Sparingly distributed on the Singile La Ridge. More plentiful in the mountains of the interior at 10,000′-12,000′. Kalo Pokhari, 10,500′, ♂ 27-4-12, secured on the Sikkim side of the Frontier, in "maling" bamboo-growth. Karponang, 10,000′, ♂ 24-3-17, one of a pair, surprised near the roadside in dense bamboo thickets.

Two specimens examined :

♂ Bill from feathers at base 22 ; wing 125-128.

Soft parts : Iris stone-yellow, (yellow ochreous-stone) ; bill ochreous-yellow, lighter at tip ; tarsus ochreous-plumbeous or plumbeous-horny; claws of a similar shade.

25. The Brown Suthora. Suthora unicolor (Hodgs.).

Resident in the *Interior* of Sikkim *from 6,500′*, and *at 10,000′ on the Singile La Ridge,* correspondingly with a suitable, dense bamboo-growth which is the habitat of this Crow-Tit in common with other interesting species. It occurs both on the ridges in the outer ranges and in the valleys of the far interior ; as it is strictly sedentary I am confident I located these birds in the identical place where Blanford recorded them from. Occurs sparingly on Tiger Hill, above Darjeeling. Obtained at 8,500′, 28-9-19. (G. E. Shaw).

Kalo Pokhari, 10,000′, ♂ 2-5-12, ♂ 7-5-12, found in parties of half a dozen or thereabouts, so could not yet be breeding.

Kedom , Lachung Valley, 6,500′, ♂ ♂ 26-2-20. 7,200′, ♀ 26-2-20.

Five specimens examined : ♂ Bill from feathers at base 14-15, av. 14·6 ; wing 85-92, av. 88·8. ♀ Bill 14 ; 14-6 ; wing 88.

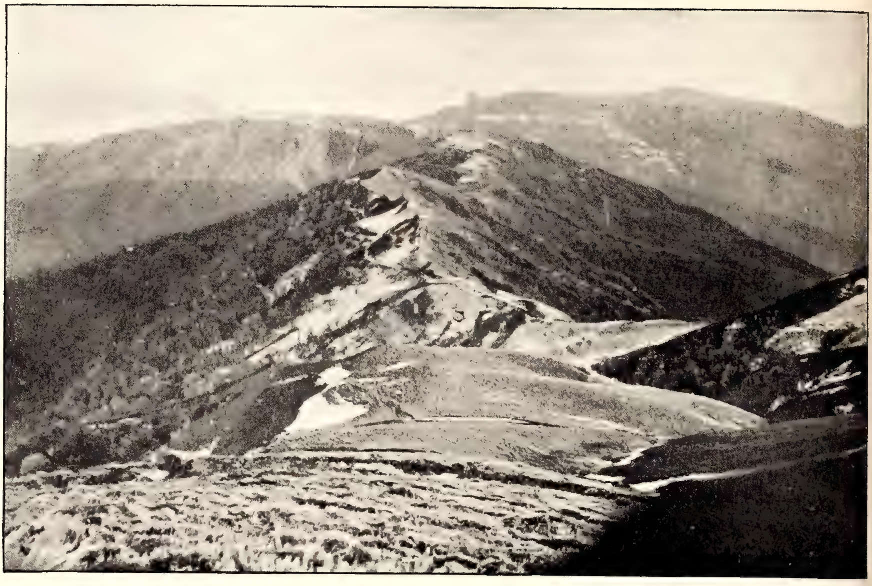
Soft parts: Iris stone-grey of a beautiful tint ; bill fleshy-yellow for two-thirds, remaining portion at tip of both mandibles lighter yellow ; tarsus greenish-grey.

26. The Black-fronted Suthora. Suthora poliotis humii (Sharpe).

Found at a lower elevation than *Suthora fulvifrons,* probably *about 6,000′-8,000′ on the Outer Ranges* and as low as *4,500′ in the Interior.* More addicted to a varied tree and scrub-growth, and therefore more generally distributed but far from common ; a pair of birds or at the most a small party accompanying a mixed assortment of Babblers, etc., Kalo Pokhari, Mai ("Khola") Valley East Nepal, 7,500′, ♂ 7-3-12, obtained in dense bamboo-growth.

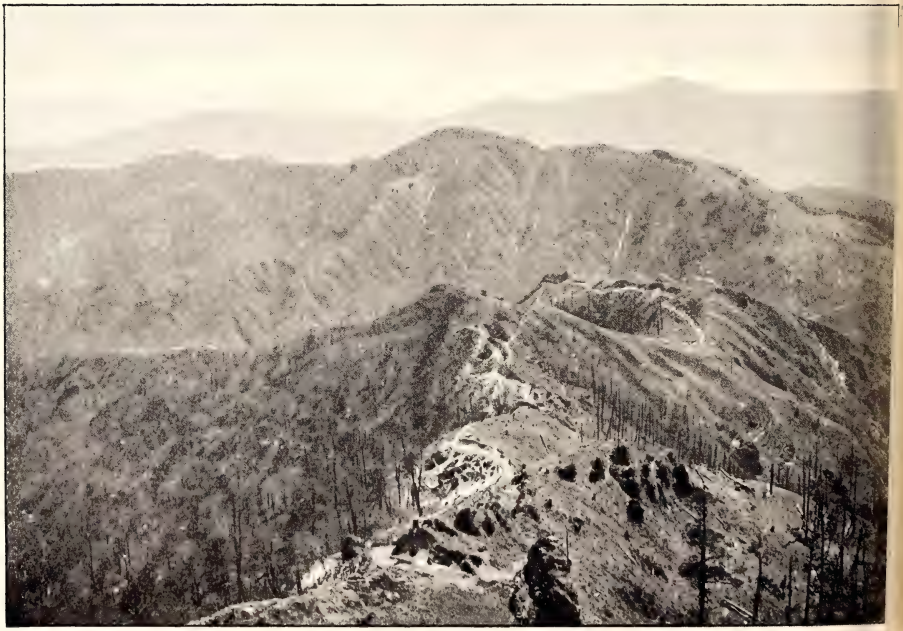
Singhik, 4,700′, ♂ 24-2-20, probably three or four pairs in a mixed party of small Babblers, inclusive of a pair of *Machlolophus spilonotus.* Gopaldhara 5,700′, 26-3-18,* evidently one pair only. I had observed a small party at 6,000′ on a previous occasion. *Not previously recorded for Nepal.*

Oates states Sikkim where this species appears to be common at and "above Darjeeling". This locality can only refer to Senchal to the south, and there is every likelihood of it still being found there in much the same quarters as *Suthora unicolor* has been located.



H. S. Photo.

SINGILE LA RIDGE.
Looking south to Sandakphu from Phalut. February, 1912.



H. S. Photo.

SINGILE LA RIDGE.
Looking south to Tonglo from Sandakphu. March, 1912.

Two specimens examined:
♂ Bill from feathers at base 7; wing 45-47.
Soft parts: Iris brown; bill black.

27. The Fulvous-fronted Suthora. Suthora fulvifrons fulvifrons (Hodgs.)

Sparingly distributed on the Singile La Ridge, more plentiful in the *Interior of Sikkim at altitudes of 9,000′-10,000′* in suitable localities, wherever the dense "prong" and "maling" bamboo covers the mountain slopes, as it apparently only frequents this habitat. Prong is the Lepcha name for the bamboo *Arundinaria aristata,* Gamble., 10,000′ and upwards. Maling (Paharia) *A. racemosa* Munro., 5,000′-9,000′, 15′-20′ in height. Kalo Pokhari, Nepal side of the Frontier, 9,000′, ♀ 24-4-12; 9,500′, ♂ ♂ 7-5-12. On the Frontier, 10,000′. ♂ ♀ 22-5-12, all obtained in dense thickets of "maling" bamboo; they feed in a great measure on vegetable substances and the insects in the crevices of the unopened sheath of the bamboo. Karponang, 10,000′, ♂ ♀ ♀ 18-3-17, secured out of a large party of twenty to thirty birds in "prong" bamboo jungle.

Six specimens examined:
♂. Bill from feathers at base 7, av. 7; wing 56-57, av. 56·7.
♀ Bill 6·5-7, av. 6·8; wing 55-56, av. 55·5.
Soft parts:—Iris red-brown; bill horny-pink; culmen with a broad band dark-horny; tarsus brownish plumbeous.

28. The Red-headed Suthora. Suthora ruficeps ruficeps (Blyth).

Recorded for Sikkim. I have failed to locate it, and I have no hesitation in stating it to be decidedly rare. Probably confined to a restricted area in the interior.

29. The Red-headed Parrot-billed Crow Tit. Psittiparus ruficeps ruficeps (Blyth).

Locally distributed and a *partial migrant,* occurring irregularly in "the rains" in the Rungbong Valley, evidently it extends by dispersal in an upward direction at the nesting period and recedes towards the plains during the "cold weather."

Nagri-Spur, at 3,800′, a small party observed on the 11-1-12, in dense secondary bamboo and reed-growth. Mangpu at 3,700′, a small party in scrub-growth. Gopaldhara, 4,000′, observed about a dozen birds mixed with *Actinodura, Mesia,* etc., keeping up a lively commotion on the 17-7-16.*4,200′, six birds noted hereabouts on the 4-4-17.*3,500′-3,600′, a pair seen in company with other small birds, Babblers etc., amongst the bamboos, 7-6-21.* Three located in the "siris" trees in the garden on the 18-5-20.* These records constitute the whole evidence available from personal observations.

Obtained at Namchi, 4,500′, 16-12-12. (G. E. Shaw). Recorded breeding in May at 2,000′, (Gammie).

30. The Grey-headed Parrot-billed Crow Tit. Psittiparus gularis gularis (Gray).

Evidently rare and locally distributed. Recorded, for Sikkim at 6,000′-8,000′, by Oates. The high limit evidently refers to Mandelli's mention of its nesting on the 17th May. Mangpu at 3,600′, ♂ 5-11-21 and at 3,600′, ♀ 18-12-20. (G. E. Shaw).

These are the only records that have come to my knowledge during ten years. Represented in the National Collection by specimens from this same locality (Gammie) and other specimens from Sikkim collected by Blanford, Mandelli and others.

FAMILY—TIMALIIDÆ.

Sub family—TIMALIINÆ.

31. The Rufous-necked Laughing-Thrush. Dryonastes ruficollis (Jard. & Selby).

Recorded by Oates "probably not above 4,000′ and mostly at the foot of the hills." Resident in the Rungbong Valley up to an elevation of 4,550′, where it is only found in patches of rank grass, reeds and mixed light tree-growth along the bed of the river. Occurs up to an elevation of 4,100′ around Mangpu and at all intermediate elevations in the Tista Valley, and reported from near Rinchenpong at an elevation of 5,400′. (C. M. Inglis). Essentially a plains Laughing-Thrush which has extended its distribution both in the valleys of the outer ranges and in the interior, wherever this more or less necessary habitat supplies the required seclusion and its wants. *The minor valleys of the outer hills ordinarily do not support a plains fauna above an elevation of 2,500′, while strict low-elevation species invariably occur in the Tista Valley for a distance of some fifty odd miles from where the river disgorges its waters into the plains, and in many cases reach a corresponding, higher altitude.* The dispersal of this species into the valleys of the interior provides an excellent case in point.

32. The Grey-sided Laughing-Thrush. Dryonastes cærulatus cærulatus (Hodgs.).

This Laughing-Thrush appears to have a better defined status in the lengthy, deep valleys than it has in the minor valleys to the west, although generally it is somewhat locally distributed. Occurs around Gopaldhara in the Rungbong Valley at elevations of from 4,500′-4,700′. Obtained above Mangpu at 5,600′, (G. E. Shaw) and at Rinchenpong at 5,400′, (C. M. Inglis). Gammie mentions it as breeding in the Tista Valley from 3,500′-5,000′.

33. The Himalayan White-crested Laughing-Thrush. Garrulax leucolophus leucolophus (Hardw.).

On the *Outer Ranges* at the junction of the Balasan and Rungbong Rivers, is not found above 2,500′ around Namsoo, and in the "kholas" on the Ambootia flat at *3,200′*. *In the Interior* of Sikkim throughout the Tista Valley *reaches a limit of about 4,500′*. Oates records it up to 6,000′, so far I have failed to locate it at this elevation. Gammie refers to it breeding in the Tista Valley up-to 3,500′ and doubts Hodgson's breeding limits of 5,000′ or 6,000′ as above quoted. (Hume's Nests and Eggs of Indian Birds. [Oates] Vol. I, p. 47).

34. The Black-gorgeted Laughing-Thrush. Garrulax pectoralis pectoralis (Gould).

Commonly found at *low limits* in the Great Rangit and Tista Valleys. Obtained as high as *5,600′* above Mangpu, (G. E. Shaw). Entirely absent from the Rungbong Valley, even at the lower reaches of the river around Namsoo, where there is ample undergrowth in the forest; no single occurrence has come to my notice. The erratic distribution of this Laughing-Thrush is another instance in proof of an extensive penetration in the deep valleys of the interior.

35. The Necklaced Laughing-Thrush. Garrulax moniliger moniliger (Hodgs.).

Occurs at *low limits* in the Great Rangit & Tista Valleys. Obtained up to an elevation of *3,900′*, (G. E. Shaw). Apparently it has no status in the minor valleys to the west at any altitude approaching 2,000′, as at Namsoo, where a certain, few 'plains species' are to be found.

36. The White-throated Laughing-Thrush. Garrulax albogularis albogularis (Gould).

Very locally distributed, yet found in large parties in favourable localities at *an elevation of not less than 6,000′.*

Mai ("Khola") Valley, East Nepal, 5 ♂ ♂, 3 ♀ ♀, 8,500′, 22-3-12. Observed sparingly along the Ridge above Pokharibong on the Nagri Spur at 6,000′.

A party of about eight individuals observed in forest below Semana Basti at about 6,700′, 6-5-23 at a time of the year when other species of Laughing-Thrushes of lower elevations are only to be found in pairs. Oates records this species at all elevations up to 8,000′ or 9,000′. This distribution is erroneous for the Sikkim Himalaya.

37. The White-spotted Laughing-Thrush. Ianthocincla ocellata ocellata (Vig.).

"Moonàli Bhiakoorah," (Paharia) so called owing to its spotted back resembling in some measure the Tragopan which is locally called the Moonal.

Occurs on the Singile La Ridge, Nepal-Sikkim Frontier, at elevations of from *9,000′-10,000′.* Odd birds are to be found at the extreme limits in *winter at 10,000′* on Tonglo, 26-1-12; specimens collected from January to August.

Soft parts: Iris stone-yellow; bill horny, a broad band on culmen shading into the colour of the lower mandible at the edge of the bill; tarsus fleshy tinged above dusky.

38. The Rufous chinned Laughing-Thrush. Ianthocincla rufogularis rufogularis (Gould).

Recorded as found chiefly from 5,000′-8,000′. This distribution for Sikkim and the hills on the North frontier of Upper Assam is erroneous. Locally distributed at "*low elevations*" *in the foot-hills.* It occurs in the Tista Valley from 3,700′-3,900′, (G.E. Shaw), and in the Great Rangit Valley, Dentam at 4,500′. (C. M. Inglis). It thus has some status in the *deep valleys of the interior.*

39. The Sikkim Red-headed Laughing-Thrush. Trochalopterum erythrocephalum nigrimentum (Oates).

Generally distributed from *4,000′-7,000′ or even 8,000′,* and obtained on Sandakphu *during the winter at 10,500′,* 15-2-12, one of a pair.

Plentiful around the station of Darjeeling throughout the whole year, as this species in common with the rest of the Laughing Thrushes is strictly sedentary. It will be noticed, on the *Outer Ranges,* I record a *higher distribution* for this species *in comparison* with *T. subunicolor.*

40. The Nepal Crimson-winged Laughing-Thrush. Trochalopterum phœniceum phœniceum (Gould).

Occurs plentifully in the Rungbong Valley from *3,000′-6,000′,* and has been recorded at almost the plains-level from the Buxa Dooars. (C. M. Inglis).

Gopaldhara, 5,800′, ♂ ♀, 24-10-21,* in dense under-growth in forest, evidently occurs at the upper limits of its range during "the cold weather."

41. The Plain-coloured Laughing-Thrush. Trochalopterum subunicolor subunicolor (Hodgs.)

Notwithstanding this species is well represented by Mandelli's specimens from the interior of Sikkim in the B.M. Collection, it appears to be extremely local and sparingly distributed. It occurs in the Mai Valley in East Nepal at *elevations of 6,000′-7,000′.* The elevation of 11,000′ as stated by Oates is in need of revision in modification for the Outer Ranges. I have failed to locate this Laughing-

Thrush in any other part of the country. Blanford obtained it at 9,000′ in the Lachung Valley and at 11,000′ on the Cho La Range, where *in the interior it occurred higher than its* congener *T. e. nigrimentum.*

42. The Black-faced Laughing-Thrush. Trochalopterum affinis affinis (Blyth).

Oates rightly records this species up to an altitude of 13,000′, which is no doubt a summer limit as they come *lower down in winter in the Interior to an appreciable extent which is not noticeable on the Outer Ranges.* This is the only instance of a descent to lower limits that I am aware of amongst the Laughing-Thrushes; and is easily accounted for by the nearness of the snow-line hereabouts. Blanford's remark" ranges above all other forms and is subalpine," is very appropriate.

Occurs in parties in the *winter at 10,000′ on the Singile La Ridge.* Observed as low as *5,350′ at Chungthang,* in the latter days of *February* 1920: a striking difference in altitude at a similar period of the year.

Chungthang, 24—26-2-20, several in the vicinity of the few scattered dwellings comprising the village; at this time the maidan was occupied by numerous Blackbirds, Thrushes, Redstarts, &c., and these Laughing Thrushes came well out into the open, always with an eye to a secluded retreat near-at-hand; all had disappeared on my return on the 11-3-20,* specimens obtained on the former occasion.

43. The Blue-winged Laughing-Thrush. Trochalopterum squamatum (Gould).

Generally distributed in suitable localities from *4,500′-7,000′ to the west* of Darjeeling and occurs in East Nepal at similar altitudes, but nowhere approaches the low limit of 2,000′ as stated by Oates. In the *Tista Valley* it has a distribution in elevation from about *3,900′-8,000′*, (G. E. Shaw). 3,500′ upwards, (Gammie).

The sexes differ as follows according to my sexed specimens. Male: Lores, forehead and ear-coverts grey; back and breast more olive than in the female; tail black. Female: Lores, forehead and ear-coverts rufous; back and breast tinged rufous; tail tinged olive; upper tail-coverts deep rufous in comparison with the male; this last character, however, does not always hold good; one of my specimens has a conspicuous white patch on the throat. There do not appear to be any specimens of *Trochalopterum lineatum lineatum* (Vig.) from Sikkim in the B.M. Coll., the species occurs in West Nepal though the exact limits of its distribution to the east is indefinite.

44. The Striated Laughing-Thrush. Grammatoptila striata striata (Vig.). "Bhiakoorah" Paharia. Used without distinction for all Laughing-Thrushes and even Scimitar Babblers, sometimes with the addition of a vague prefix.

Commonly occurs on the *Outer Ranges from 3,500′-7,000′* or somewhat higher. In the *Interior of Sikkim to be found around 2,500′*, above Dikchu. Occurs from 4,500′-7,500′ above Mangpu and upwards to Senchal. (G. E. Shaw). Recorded by Oates for the Himalayas from 6,000′-9,000′ which is in need of correction for the Eastern Himalayas at all events.

45. The Bengal Babbler. Turdoides terricolor terricolor (Hodgs.).

A 'plains' Babbler, generally and commonly distributed in the Sikkim Terai and Bhotan Dooars. Recorded "appears to ascend the hills to about 5,000′". With the exception of the following record, neither Mr. G. E. Shaw nor myself have met with it at anything approaching this altitude. I have no hesitation in regarding this occurrence as merely accidental, as it is extremely unlikely to be overlooked. Gopaldhara, 4,550′, 4-5-21,* a pair observed hereabouts; these birds rose at my feet to settle on an adjacent tree whence their vivacious movements, particularly a whirling oscillation of the tail, were very pronounced.

46. The Slaty-headed Scimitar-Babbler. Pomatorhinus schisticeps schisticeps (Hodgs.)

Evidently *confined to the lower foot-hills.* Obtained in the Tista Valley below Mangpu at 3,800′, (G. E. Shaw). Entirely absent from the minor valleys in the west of the Darjeeling district at anything approaching this elevation. Mandelli is mentioned as having obtained it breeding at Namtchu(Namchi) and Yendong. The first-named place is overlooking the Great Rangit Valley, the whereabouts of the last locality is unknown to me unless it refers to Tendong.

47. The Nepal Coral-billed Scimitar-Babbler. Pomatorhinus ferruginosus ferruginosus (Blyth.)

Sparingly distributed. Occurs at *elevations of from 4,000′-6,000′ in the Rungbong Valley.* So far Mr. G. E. Shaw has failed to obtain it in the Tista Valley where Gammie obtained it breeding at 5,000′. There is a likelihood of it being overlooked as it is anything but a common bird. Evidently less numerous in Sikkim than it was in the far Eastern Himalayas (Daphla & Miri Hills) at similar altitudes.

48. The Nepal Rufous-Scimitar-Babbler. Pomatorhinus ruficollis ruficollis (Hodgs.)

Generally distributed from *4,700′ in the Rungbong Valley* to as high as *10,000′ on the Singile La Ridge in winter,* at which last-mentioned elevation it has been observed in pairs in company with parties of small Babblers. Obtained at 9,500,′ ♀ 6-2-12, and around Mangpu, at 5,000′, (G. E. Shaw), also at Rinchenpong at 5,400′, (C.M. Inglis), Rishap (Rashab), 4,500′, (Gammie). Gopaldhara, 5,800′, ♂ ♀ 24-10-21, in forest undergrowth, a pair only. 5,500′, 18-5-23*, youngsters on the wing, accompanied by their parents, on the forest outskirts. In my experience there appears to be a marked absence of Scimitar Babblers in the Interior of Sikkim, despite a sufficiency of undergrowth; where there is a paucity of this vegetation, even in forested country, there is little chance of meeting with them. These birds are not gregarious as the Laughing-Thrushes and invariably occur in pairs.

Soft parts: Iris crimson-brown; bill, basal half of upper mandible black tapering along commisure, remaining portion yellowish-horny, deepest at gape; tarsus pale plumbeous-horny; soles dull plumbeous-yellow.

49. Harington's Rusty-cheeked Scimitar-Babbler. Pomatorhinus erythrogenys haringtoni (Stuart Baker).

Commonly occurs and is quite the most plentiful of all the members of this genus. Found in the *Rungbong and Mai Valleys from 3,500′-6,500′.* Obtained as low as *1,200′ in the Tista Valley.* (G. E. Shaw). An elevation of 10,000′, as stated by Oates, is far too high a limit for the Sikkim Himalaya. Breeds very early in comparison with some of the other Babblers. Young birds to the number of four in the nest, 27-4-12, at 7,000′ approx. Mai "Khola", East Nepal.

50. The Slender-billed Scimitar-Babbler. Xiphiramphus superciliaris Blyth.

Evidently *not previously recorded from Nepal.* Hodgson records it breeding from 3,000′-6,000′. I have failed to meet with it at anything approaching these limits. Gammie, obtained it on the Mahalderam Ridge at 7,000′ breeding. Kalo Pokhari, Singile La Ridge. Obtained both in Nepal and Sikkim, *April and*

May at elevations of from 8,000′-10,000′. It was found during these months in pairs in the dense "maling" bamboo thickets on the mountain slopes. Its call is unmistakable, yet not easily described in syllables.

Soft parts: Iris pale stone-yellow; bill dusky-black, lightish at tip of lower mandible; tarsus and claws, plumbeous.

51. The Bengal Red-capped Babbler. Timalia pileata bengalensis (Godw-Aust)

Recorded for the lower hills along the border of Sikkim, &c. Obtained in *the plains* of the Darjeeling district (G. E. Shaw), and I have observed it in "low-lying" ground, a few miles out from the base of the hills in the Eastern Dooars. It is unlikely to be found in the valleys, unless it has worked its way along the beds of the main rivers, lavishly overgrown with reed and heavy grass-jungle. There is small chance of locating it anywhere else, and the foot-hills are out of the question as they are covered with forest.

52. The Rufous-bellied Babbler. Dumetia hyperythra (Franklin).

Probably this Babbler has a clearer defined status to the west of this area, though recorded for the Lower valleys in Sikkim. Its whereabouts is unknown to me. It is not represented from the Sikkim Himalaya in the B. M. Collection.

53. The White-headed Shrike-Babbler. Gampsorhynchus rufulus rufulus (Blyth.)

Occurs in the Tista Valley at *low elevations* where I have observed it commonly between Melli and Tar Khola.

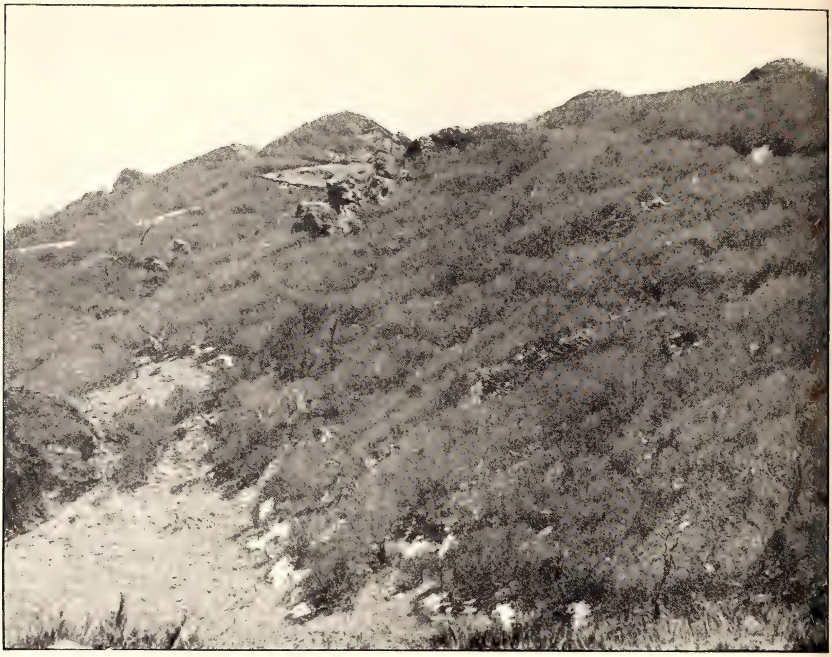
To my mind I associate this Babbler, as typical of a host of others, with steep, broken ground, thickly studded with bamboos and a diverse tangle of secondary undergrowth,—a different phase of verdure to that of the grander forested tracts which do not undergo a transformation of colour to the same extent, yet are similarly subject to a period of prolonged drought followed by months of an incessant deluge; when the whole aspect of the vegetation suddenly passes rapidly from varied tints of brown to vivid greens. Nowhere are these effects seen to better advantage than in this valley, when at times; it seems as if every living plant was endeavouring to extract the last ounce of moisture and nutriment out of the shallow soil, awaiting the never-failing monsoon, when all forms of life are bathed in drenching rain and steamy heat.

54. The Indian Yellow-eyed Babbler. Pyctorhis sinensis sinensis (Gmel.).

The exact status of this Babbler in the Sikkim Himalaya is very obscure. Recorded for every portion of the Empire and found in the hills up to 5,000′. I have signally failed to locate this Babbler and very much doubt if it occurs unless at the *plains-level.* Represented in the series of the B. M. Coll. by one specimen from Sikkim and three from Darjeeling without other data as to exact localities, etc.

55. Mandelli's Spotted Babbler. Pellorneum ruficeps mandellii (Blanf.)

Mainly confined to the *Terai of the foot-hills,* which supports a *plains fauna.* Occurs around Namsoo up to 3,000′, and below Mangpu in the Tista Valley up to an elevation of 3,800′, (G. E. Shaw).

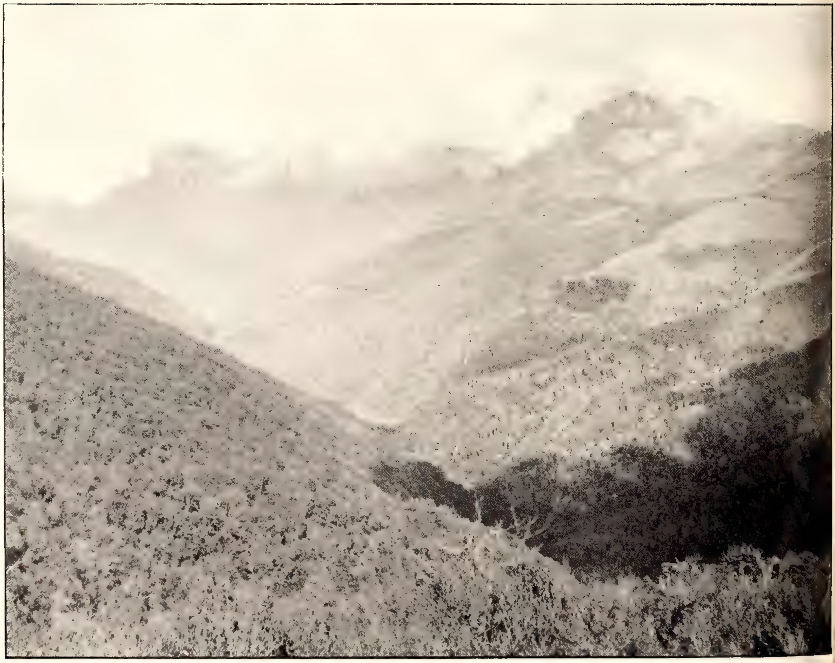


H. S. Photo.

DWARF RHODODENDRON.

Sandakphu, 11,923′. North face of the summit. March, 1912.

Haunts of *Lophophanes ater æmodius*, *L. rufonuchalis beavani*, *L. dichrous*, *Certhia familiaris nipalensis*, *C. stoliczkæ*, *Phœnicurus schisticeps*, *Troglodytes nipalensis*, *Montifringilla nemoricola*, &c., &c.



H. S. Photo.

MAI ("KHOLA") VALLEY, EAST NEPAL.

From Kalo Pokhari, May, 1912.

Forest of Oak, Chestnut, Magnolia, Rhododendrons, Maples, Laurels, &c., &c.

Haunts of *Ianthocincla ocellatum*, *Xiphirhynchus superciliaris*, *Lioparus chrysotis*, *Arborophila torqueola*, *Tragopan satyra*, &c., &c.

56. The Long-billed Wren-Babbler. Rimator malacoptilus (Blyth).

Rare. Gopaldhara, 5,600′, 1-2-21*. A pair in forest undergrowth with their usual fearlessness. Although they were under observation within a few paces I was unable to follow their movements for more than a brief interval as they shipped away like small rodents in the broken and steep ground. Recorded, "only at considerable elevations." What is inferred by this distribution is evidently incorrect as it has been more frequently met with at *moderate elevations.*

57. Abbott's Babbler. Malacocincla sepiaria abbotti (Blyth).

Obtained at *plains-levels* around 500′ elevation in the Darjeeling district (G. E. Shaw).

58. The Nepal Babbler. Alcippe nipalensis nipalensis (Hodgs.).

Commonly distributed from the *plains-level up to 6,000′.* Very partial to thick cover in general with numerous other small Babblers.

59. The Black-throated Babbler. Stachyris nigriceps nigriceps (Hodgs.) "Moostay", Paharia.

Commonly occurs from the *plains-level up to 6,000′* at all events. I have no record of it attaining 10,000′ in summer as stated by Oates. Breeds at all intermediate elevations. Equally plentiful, both in the interior and on the outer ranges.

60. The Nepal Golden-headed Babbler. Stachyris chrysæa chrysæa (Blyth).

Generally distributed and fairly numerous *at similar altitudes* as *S. nigriceps.* Commonly nests around Gopaldhara at 4,500′-5,500′. Apparently not much in evidence around Mangpu, yet it occurs in the upper reaches of the Tista Valley around Toong at 3,850′.

61. The Red-headed Babbler. Stachyridopsis ruficeps ruficeps (Blyth).

Found at *all moderate elevations upto 7,500′.* Tonglo, ♂ ♀ 25-5-12. More numerous below 6,000′. Obtained at elevations of from 6,200′-7,400′ on the eastern side of the district above Mangpu, (G. E. Shaw). Breeds commonly around Gopaldhara and in the Mai "Khola" in East Nepal.

62. Harington's Red-fronted Babbler. Stachyridopsis rufifrons ambigua (Harington).

This Babbler occupies a lower zonal distribution area than *S. ruficeps.* Obtained in the *Tista Valley,* March and April, at elevations of from *2,500′-2,600′.* (G. E. Shaw). A locality where numerous plains-species penetrate the hills which species are entirely absent or poorly represented at similar elevations to the West.

63. The Yellow-breasted Babbler. Mixornis rubricapilla rubricapilla (Tick.).

Probably does not occur beyond the *base of the foot-hills,* where it has been obtained at the plains-level. (G. E. Shaw).

64. The Dusky-green Babbler. Pseudominla cinerea (Blyth).

Extremely locally distributed. Occurs in the *Interior at elevations probably not exceeding 4,000′* in the hot, moist valleys. Toong, Tista Valley, 3,850′, 24-2-20. I found these birds in a mixed company of other small Babblers of which *Stachyris chrysæa* was noticeable in light tree-growth on this occasion, which was somewhat at variance to my experience in former years when they freely came under my observation in the Miri Hills on the Assam frontier; they were then exclusive in their habits and kept apart from the mixed assortment of birds so frequently to be met with, when on their rounds.

65. The Chestnut-headed Babbler. Pseudominla castaneiceps castaneiceps (Hodgs.).

Generally distributed at elevations of from *3,500′* in the Rungbong Valley up to *10,000′* on the Singile La Ridge according to season; so far not obtained below 5,900′ above Mangpu, (G. E. Shaw). Observed commonly between Shamdong and Singtam at *2,400′*, 15-3-20. Frequents the bottoms of the valleys in the winter months, gradually ascending with the advent of the warmer weather to its extreme limits; then found in company with Tits, Yuhinas &c.—a totally different assembly from its "cold weather" associates; it breeds plentifully at 5,000′. Ghoom to Sookia Pokhari, 7,300′, ♂ 19-1-12. Kalo Pokhari, 10,000′, ♀ 17-4-12. Equally common in the Mai "Khola" in East Nepal, April and May 1912.

66. Hodgson's Fulvetta. Fulvetta vinipecta vinipecta (Hodgs.).

Recorded distribution "11,000′ or more." Mandelli obtained it breeding on Senchal where it commonly occurs nowadays.

Generally distributed from 7,000′-12,000′. Observed below Semana Basti, at *6,500′*, 8-2-18.* Occurs at all intermediate elevations, irrespective of season, as numbers frequent the summit level of Tonglo at *10,000′ in the winter*, January and February 1912. Numerous parties in scrub-growth around the village of Lachung at *9,000′ in February and March* 1920. Evidently breeds around Jalapahar and Katapahar, circum. 8,000′, as it commonly occurs there in "the rains." 17-4-21,* numerous and obstrusive. Ghoom, 7,300′, 19-1-12, large parties about, bitterly cold and misty weather. Sandakphu, 11,500′, 21-5-12. Nest composed of moss, bents and strips of bamboo leaves enclosing a cup-shaped hollow lined with hair, containing three eggs of the recorded type.

Soft parts: Iris pale greenish-yellow; bill upper mandible and terminal half of lower mandible dark horny, base of lower mandible pinkish-horny; tarsus and claws dull horny, somewhat lighter than bill in colour.

67. The Golden-breasted Tit-Babbler. Lioparus chrysotis (Hodgs.).

Widely distributed but far from numerous. Occurs mostly at *elevations* of from *6,500′-10,000′*, at a somewhat lower zonal area throughout the year according to season, than *Fulvetta vinipecta*. Partial to dense growth on steep ground. Kalo Pokhari, Mai "Khola", East Nepal, 8,000′-10,000′, March to May. Lachung Valley, Sikkim, 7,200′, 26-2-20, a small party intermingled with other small birds in forest. Sonada to Mangpu, 6,750′, 19-5-21*, in small parties hereabouts in ("gopi") bamboo thickets in forest.

Soft parts: Iris brown; bill deep plumbeous; base of membrane pinky-white; tarsus dark ochreous-fleshy.

Sub-family—SIBIN.

68. The Long-tailed Sibia. Sibia picaoides picaoides (Hodgs.).

Found from the *base of the hills up to a little over 2,500′*. An elevation of 5,000′ as stated by Oates, is much too high a limit for Sikkim.

Namsoo, 2,000′, 23-1-17*. A large party observed frequenting the flowers of the "simal" (*Bombax*) cotton trees. It came under my observation beyond Singtam in the Tista Valley at 1,800′ in February and March 1920. Obtained in the lower limits of the Tista Valley below Mangpu at 2,500′. (G. E. Shaw).

69. The Black-headed Sibia. Leioptila capistrata capistrata (Vig.).

In the Rungbong Valley occurs as low as 3,400′, and is found at all elevations up to *8,300′*, (G. E. Shaw,) around which elevation it occurs on Senchal in the outer hills. In the Tista Valley observed at an extreme low elevation, near Rasab, of *1,700′* and *1,850′*, 15-3-20′*, frequenting "simal" (Bombax) trees when in flower, and around Dickchu at 3′000′ in February. Only recorded from 5,000′-8000′. On occasions familiar to a degree. Gopaldhara, 28-6-23*, a single bird came on to the verandah, searching the pots of geraniums in quest of spiders. This Sibia is a sprightly bird with a loud, pleasing whistle. It is quite a characteristic feature of the bird-life in the station of Darjeeling.

70. Blyth's Sibia. Leioptila annectens annectens (Blyth).

The type locality is evidently Darjeeling and is thus recorded for Sikkim at an elevation of 4,000′ and upwards. Apparently only locally distributed. I have failed to locate it anywhere in the vicinity of Gopaldhara at all elevations of from 3,450′ to over 6,000′, and it remains one of my desiderata. Information in respect to its status is lacking. Represented by mounted specimens in the Darjeeling Museum.

The B.M. Coll. contains 13 specimens. February, June-August, November, without precise data of locality and elevation.

71. The Nepal Bar-wing. Actinodura egertoni egertoni (Gould).

Commonly occurs in the Rungbong Valley at *elevations of from 4,000′-6,000′* and similarly in the Tista Valley up to an elevation of 5,500′. (G. E. Shaw). This Bar-wing is much more partial to secondary growth of scrub than it is to well-wooded tracts, being much less arboreal than the Sibias and in its habits shows in this respect some resemblance to the Laughing-Thrushes.

72. The Nepal Bar-wing. Ixops nipalensis nipalensis (Hodgs.).

More or less numerous at *elevations of from 7,000′-10,200′ on the Outer Ranges*. On one occasion observed near Sookia Pokhari. It frequents the tops of the trees in parties at high elevations. Although this Bar-wing belongs to a genus of tropical birds, it has *a distinct Palæarctic distribution*. 4,000′ at its lowest limit as recorded by Oates is entirely erroneous for Sikkim, Singile La Ridge, Nepal-Sikkim Frontier, slopes of Tonglo, circum. 8,500′ ♂ ♂ 20-1-12. Kalo Pokharl 10,000′, ♂ ♂ ♀ 7-2-12, 10,160′ ♀ 22-3-12., winter records.

73. Hume's Staphidia. Staphidia striata rufigenis (Hume).

Obtained in the *Tista Valley at elevations of from 2,000′-5,100′*. (G. E. Shaw). It is *absent from the western parts of the district*, and has no status at similar elevations in the Rungbong Valley.

74. The Stripe-throated Siva. Siva strigula strigula (Hodgs.).

Plentifully distributed from *5,500′-10,200′ on the Singile La Ridge.* Occurs around Singhik in the *interior of Sikkim at 4,700′*, both these low elevations are undoubtedly extreme " cold weather " limits. On the Outer Ranges numerous at and below 7,000′ in the winter yet nowhere reaches the 3,000′ limit as recorded for the Himalayas by Oates. Ghoom to Sookia Pokhari, 7,300′, 3 ♀ ♀ 19-1-12. Senchal, 8,000′, ♀ 6-2-17. Mai "Khola", East Nepal, 10,000′ and lower, 19th March to 8th May 1912, 3 ♂ ♂, 4 ♀ ♀. Blanford met with it on the Cho La Range at 10,000′ and in the Lachung Valley at about 9,000′ in the autumn of 1870, at which localities and elevations it is absent in the winter according to my observations.

75. Hodgson's Blue-winged Siva. Siva cyanouroptera cyanouroptera (Hodgs.).

Generally distributed on the *Outer Ranges at all elevations up to 5,500′.* It moves down the slopes of the hills to some slight extent during the cold weather while its upper limit is exceeded in the *Interior* even *in winter,* when I saw an odd pair in company with a party of *Minla ignotincta* at *5,800′* in Gangtok on the 21-2-20.* It is often to be seen around Gopaldhara at 4,700′ in December and January, intermingled with Minlas and several *Pteruthius erythropterus*, or a pair of *P. melanotis.* Observed in parties on the Semana-Mirik Ridge at 6,000′, 6-5-23.

76. The Stripe-throated Yuhina. Yuhina gularis gularis (Hodgs.).

The first under-mentioned occurrence most probably denotes a descent from the Senchal Ridge, when two specimens were obtained on one occasion at Mangpu, *3,800′*, 4-4-18 (G. E. Shaw), a remarkable record in altitude, up to *10,000′* on the *Singile La Ridge,* where it commonly occurs on Tonglo summit in *January and February,* and numerous at Kalo Pokhari at 10,160′ in March. Found in parties which haunt the tops of the trees with lively twitterings. *This Yuhina ascends the highest on the Outer Ranges in comparison with the other two species, and has a decided Palæarctic status.* Blanford states "Less common than *Y. occipitalis* in the pine forests above Lachung, though still by no means rare. Common above 10,000′ on the Cho La Range where I did not meet with *Y. occipitalis.* (August.) I have failed to meet with it in these localities at similar elevations in the winter, and there is little doubt it occurs in the bottoms of the valleys in the interior at this period of the year, when it is certain to ascend to a much more appreciable extent than is possibly the case on the outer ranges.

77. The Slaty-headed Yuhina. Yuhina occipitalis occipitalis (Hodgs.).

This Yuhina belongs to an Oriental genus, but equally with the previous species has a definite *Palœarctic status.* Generally distributed from about *6,500′-10,200′* on the *Outer Ranges,* at which higher limit it occurs during mild spells of weather in the winter, but is apparently absent during the severe weather. *In the Interior* occurs however at *9,000′ in the winter* in the bottoms of the valleys, where it appears to attain *a higher limit* than *Y. gularis,* as I observed several south of Lachung at 9,000′ on the 26-2-20*. Singile La Ridge, Kalo Pokhari, 10,160′, 16—19-3-12, several in evidence, having arrived from the valleys below, on to the ridge, with the advent of hot weather. This Yuhina and *Y. gularis* were partial to the rhododendron trees, and kept up a lively time when probing their bills into the flowers in search of insect food. Semana Basti, 6,500′, 8-2-18*, plentiful hereabouts. Blanford states "Jerdon says rare near Darjeeling, is very common and abundant in the pine forests between 8,000′-10,000′ in the Lachen and Lachung Valleys" (September & October).

78. The Black-chinned Yuhina. Yuhina nigrimentum nigrimentum (Hodgs.).

Strictly *confined to the hot, moist valleys,* and thus has a *tropical status.* Occurs in the Tista Valley in the interior up to an elevation of 2,300′ in February and March. Obtained in the lower reaches of this valley at 1,200′. (G.E. Shaw). Gammie obtained it breeding at Rungbee at about 3,500′. In former years it was obtained in the Miri Hills on the north frontier of Upper Assam at 4,000′ in the cold season.

Dickchu to Singhik, 2,300′, 23-2-20 and 13-2-20, in large parties, confined to this species, haunting the foliage of the evergreen trees.

The distribution "considerable elevations only" for the Eastern Himalayas as stated by Oates is entirely erroneous.

79. The Chestnut-headed Ixulus. Ixulus occipitalis (Blyth).

Gammie is mentioned having obtained it breeding at Rungbee at about 3,000′, and it is thus recorded by Oates for Sikkim. It is probably restricted to the *base of the hills* or at *moderate elevations,* a similar distribution in altitude, as its status is to the North-East, in the foot-hills of Upper Assam.

80. The Yellow-naped Ixulus. Ixulus flavicollis flavicollis (Hodgs.).

Recorded at elevations of from 5,000′-8,000′ for the Himalayas. It extends in its distribution from the *foot of the hills up to 7,500′.* Equally plentiful in the interior of Sikkim at a similar period of the year around Singhik at 4,600′ as it is around Gopaldhara at 4,720′. Odd parties observed near Jainti, Eastern Dooars, at the plains-level in January 1922. Gopaldhara, 4,700,′ ♂, 31-12-11. Semana basti, ♂, 20-1-12. Observed on the Semana—Mirik Ridge at 6,500′, in parties, feeding on the Yellow Raspberries (*Rubus sp ?*) in early June, 1923.

Kalo Pokhari, Mai "Khola," East Nepal, ♀ 2-5-12. Blanford records it from (Lamteng) Lachen at 9,000′ in September, which denotes a deep penetration in the interior along the defile of the Tista Valley.

81. The White-bellied Herpornis. Erpornis xantholeuca xantholeuca (Hodgs.).

Confined to the deep, hot valleys and has a *tropical status.* In the Tista Valley, it occurs up to an elevation of 3,300′ in the outer hills. (G. E. Shaw.) Oates rightly remarks: "it does not appear to be found above 4,000′ or 5,000." These limits leave a wide margin in altitudinal distribution, as there is no likelihood of any record being forthcoming from the upper extreme limit quoted, at all events in the Sikkim Himalaya.

Sub-family.—LIOTRICHINAE.

82. The Indian Red-billed Liothrix. Liothrix lutea callipyga (Hodgs.).

"**Jharjhari,**" Paharia, probably also used for *Mesia.*

It is unfortunate no two authorities agree as to the exact rendering in nomenclature of this species, which is sometimes referred to as *Liothrix luteus callipygus,* Hodgson appears to have named it *callipyga.*

Amongst the smaller songsters, the delightful notes of this cheery, vivacious bird at the breeding season are by no means without variety and compass. A resident, and commonly distributed at *all elevations from 3,400′-7,400′* and possibly higher as it is recorded " at 5,000′-8,000′ or lower for the Himalayas."

It forages much on the ground in secondary-growth, whilst it may often be seen haunting creeper-festooned trees at some height from the ground, invariably in parties before and after the nesting season.

This bird in common with several others, *Mesia argentauris, Suya atrogularis,* &c., has accommodated itself to the cultivated tracts under "tea" of the Darjeeling District, notwithstanding it suffers considerable depletion of its eggs at the nesting season, as the Paharia youth spares nothing in the egg and bird line which comes his way. The benefit these numerous small insectivorous Babblers bestow is by no means fully appreciated or even realized.

83. **The Nepal Cutia. Cutia nipalensis nipalensis** (Hodgs.)

" Motum pho," Lepcha.

Locally distributed. Apparently found chiefly at an *elevation of 7,000′ on the Outer Ranges.* Occurs as low as *5,000′ in the Interior* of Sikkim. Ghoom, 7,000′ 17-1-17 *, in parties. Singhik, 5,200′, 12-3-20, a small party. Mai (" Khola ") valley, East Nepal, ♂ 16-4-12. Obtained at an elevation of 5,900′, ♂ 28-6-19 and as low as 4,500′, ♀ on one occasion, 23-5-20, above Mangpu. (G. E. Shaw.)

Soft parts. : Iris dull red-brown; bill horny-black, basal half of lower mandible bluish-horny tapering to a point ; tarsus gamboge-yellow ; claws light horny.

84. **The Red-winged Shrike-Tit. Pteruthius erythropterus** (Vig.).

Irregularly distributed from *4,000′-6,000′* and apparently locally migratory. Recorded by Oates in its distribution for the Himalayas 2,500′, (Jerdon) 10,000′, (Stolickza). I have no acquaintance with this Shrike-Tit occurring at these extreme limits. Noted as common at Gopaldhara at elevations of from 4,000′-5,000′, September, October, November, December, February, and at the end of March over a period of ten years. Its appearances, however, being somewhat erratic. Strictly confined to well-forested country. Found around Singhik at 4,600′ in February and March. Obtained at elevations of from 3,700′, March, to 4,500′, April, at Mangpu, (G. E. Shaw.) Gopaldhara, 5,700′, 26-3-18 *, several noted in company with a host of various small birds. 5,500′, 10-2-19 *, many noted under similar conditions. 5,000′, 7-10-21*, observed an odd bird or so hereabouts.

Soft parts : Iris stone-grey ; bill bluish-horny, upper mandible dark horny-blue ; tarsus, pale fleshy.

85. **The Chestnut-throated Shrike-Tit. Pteruthius melanotis melanotis** (Hodgs.).

This dainty Shrike-Tit is not common, yet occurs in pairs in the wooded portions of these hills where it is widely distributed at *moderate elevations.* Recorded for the " Himalayas at high elevations 7,000′ or so." Obtained at elevations of from 2,700′, January, to 6,200′, March, in the Tista Valley. (G. E. Shaw.) In the Rungbong Valley occurs from 3,500′-6,000′, and somewhat higher in " the rains," a pair observed at 6,200′, 1-6-23*, on the Semana-Mink Ridge. Its actions are very slow compared with the agility displayed by *Minla ignotincta, Pseudominla castaniceps* with which and others pecies it often keeps company. Observed in the interior of Sikkim at Singhik at 4,600′, and below Chungthang at about 5,000′ in February and March. I have never observed more than one pair of this Shrike-Tit on any one occasion mixed up with other birds, whereas, *P. erythropterus* often occurs in small parties of the two sexes.

My experience of this bird in the Sikkim Himalaya further confirms my observations on the North Frontier of Assam in regard to its zonal distribution.

Soft parts: ♀ Iris brown; bill, upper mandible dark plumbeous-horny, lower mandible similar only lighter; tarsus fleshy; claws pale horny.

86. **The Green Shrike-Tit. Pteruthius xanthochloris xanthochloris** (Hodgs.).

Generally distributed both in the Interior and on the Outer Ranges.

This Shrike-Tit occurs at higher limits than the other two members of this genus and has a decided *Palæarctic status in its distribution area.*

During the *winter* it may be found at elevations of from *7,000′-9,500′* at which last elevation I obtained it at Lachung, ♂ 2-3-20, and at 9,600′, at Karponang ♀ 24-3-17, which may be regarded as extreme high winter limits, as pairs were only in evidence, although these elevations are likely to be exceeded in the summer. It frequents low trees during the winter, and with the approach of warmer weather when it undoubtedly ascends to some extent, occupying the tops of the highest trees. This last trait combined with its dull green plumage renders it inconspicuous amongst the dense foliage, and it is secured with difficulty. Soft parts: ♀. Iris brown; bill bluish-slaty.

87. **The Rufous-bellied Shrike-Tit. Hilarocichla rufiventer** (Blyth).

Sparingly distributed. Evidently *does not transcend the limits of 6,000′-8,000′* to any appreciable extent *on the Outer Ranges.* Occurs on Senchal at 8,000′, Gopaldhara, 6,000′, 5-11-19, two females secured out of a party frequenting the tops of lofty trees in forest.

Soft parts: ♀ Iris dark stone-grey; bill bluish-horny, upper mandible dusky; tarsus dark fleshy-horny; soles pale yellow.

88. **The Common Iora. Ægithina tiphia tiphia** (L.).

Commonly occurs from the *Plains-level* up to 4,740′, at all events around Gopaldhara, and obtained in the Tista Valley, up to *an elevation of 5,600′*, above Mangpu. (G.E. Shaw.) This latter record is no doubt an extreme limit for this Iora, as Oates rightly infers "it does not appear to ascend the hills higher than 3,000′ being strictly a bird of the plains." My own impression is that it is extending its distribution under favourable conditions. It has obtained a higher limit in the Tista Valley, which is only one instance of many similar cases, which receive notice under specific circumstance.

89. **The Fire-tailed Myzornis. Myzornis pyrrhoura** (Hodgs.).

Locally distributed. *On the Singile La Ridge occurs up to 10,160′, in March and April,* both in Nepal and Sikkim, and in all probability not found below 7,500′ or thereabouts. Apart from a doubtful observation below Ghoom at 7,500*. my records without exception refer to the Nepal-Sikkim Frontier at Kalo Pokhari, 5 ♂♂, 6 ♀♀, collected between the 19th of March and the 30th of April.

Jerdon appropriately names this bird a Flower-picker. It was this fact which first gave me the clue to its whereabouts, otherwise I expected to find a Creeper-like bird haunting the tree trunks as mentioned by Oates; whereas, it was an agreeable surprise to see it "*hovering with a rapid beating of the wings at the flowers*" of the Rhododendron trees. It is generally silent and unobtrusive even at or towards the nesting season when birds are at their liveliest. Its note is a feeble but distinct call. Blanford records it as common on the *Cho La Range at 11,000′ in August* where it was obtained amongst brush wood, on mossy banks and once was shot on the ground. "Not seen in Upper Sikkim." I have also not met with it in the interior. It certainly occupies a lower zone during the winter and ascends to breed at these recorded limits.

Soft parts: Iris brown; bill black; tarsus ochreous horny tinged with green; claws dark horny.

90. The Gold-fronted Chloropsis. **Chloropsis aurifrons aurifrons** (Temm.).

Occurs at *low elevations* in the Tista Valley, and has a tropical habitat. Obtained up to 2,300′ in elevation. (G. E. Shaw.)

91. The Orange-bellied Chloropsis. **Chloropsis hardwickii hardwickii** (Jard. & Selby).

Resident at *all elevations up to 5,500′* in the Rungbong Valley, and occurs up to a similar altitude in the Tista Valley, 5,000′. (G.E. Shaw). It possibly reaches the limit of 6,000′ as recorded by Oates.

92. The Silver-eared Mesia. **Mesia argentauris argentauris** (Hodgs.).

The Mesia is more addicted to secondary scrub-growth than forest. It utilizes the "tea-bush" in common with Liothrix to a great extent at the nesting period. Recorded from 3,000′-7,000′. Obtained in the *Tista Valley as low as 1,500′*. (G. E. Shaw.) I have no information respecting its status at plains-level as was the case in the foot-hills of the North frontier of Upper Assam. It is common at all elevations in the Rungbong Valley up to 5,500′, but here again it has been overlooked below 3,000′, if it actually does occur below this limit.

93. The Red-tailed Minla. **Minla ignotincta** (Hodgs.).

This species frequents all well-wooded tracts. During "the cold weather," it invariably is found in parties which intermingle with other tree haunting species; as they methodically search the tree trunks and foliage, they are very Tit-like in this habit. It is generally distributed at *all elevations up to 8,500′* according to season, at which elevation it occurs on Senchal. Blanford records it from Lachen and Lachung at 9,000′, but not higher in September and October. It is commonly resident around Gopaldhara at 4,500′-6,000′, between which limits it breeds, and is equally plentiful in the interior of Sikkim. Gangtok, 5,800′, 21-2-20.* Around Jainti, Eastern Dooars, at the base of the hills, a party of this Minla came under my observation in early January, 1922; I did not meet with them at a later period. I have formerly recorded it from the Gorges of the rivers in Upper Assam at similar low-levels in "the cold weather."

(*To be continued.*)

DRAGONFLY COLLECTING IN INDIA.

BY

MAJOR F. C. FRASER, I.M.S., F.E.S.

PART IV.

(*With 3 plates.*)

(*Continued from page 481 of this volume.*)

Subfamily—*Protoneurinæ* :—

258. The nervure Cuii absent 259
Cuii present and usually well developed 290

259. A supplementary basal nervure present proximal to *ac* 260
No supplementary basal nervure proximal to *ac* 272

Genus—*Protosticta* :—

260. The anal bridge (*ab*) absent 261
The anal bridge present, running from the lower side of quadrangle to join either *ac* or the hinder margin of wing 266

261. Abdominal segments 8 and 9 of nearly equal length ; stigma blood red 262
Abdominal segment 8 more than twice the length of segment 9 ; stigma black 263

262. Abdomen 47mm. in length ; 16-18 postnodal nervures in the forewing ; segment 8 bluish white with the dorsal ridge and a narrow apical ring black .. ..*Protosticta sanguinostigma.*
Abdomen only 44mm. in length ; only 15 postnodal nervures in forewing ; segment 8 bluish white, the apical third and the dorsal ridge broadly white .. ..*Protosticta cerinostigma.*

263. Abdomen only 35 mm. in length ; prothorax bluish white, unmarked; segment 8 bluish white with a narrow apical black ring ..*Protosticta hearseyi.*
Adbomen 40 mm. in length or more ; prothorax marked with black ; segment 8 veriable .. 264

264. Segment 8 entirely black .. .. ..*Protosticta gravelyi.*
Segment 8 marked with white or bluish white 265

265. Segment 8 with the apical half and a narrow basal ring black ; a narrow black ring on the posterior part prothorax .. .. ..*Protosticta mortoni.*
Segment 8 with more than the apical half black, no basal black ring, the middorsal ridge on the bluish part finely black ; prothorax with a small triangular marking of black posteriorly .. ..*Protosticta stevensi.*
Segment 8 almost entirely white, its apex narrowly and diffusely black ; prothorax black with a longitudinal subdorsal yellow stripe..*Protosticta lindgreni.*
Segment 8 with the apical half bluish white ; prothorax black on the dorsum, the sides whitish .. ..*Protosticta himalaiaca.*

Genus—*Drepanosticta* :—

266. Sectors of arc fused for a short distance at their origin 267

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	Sectors of arc separated at their origin	270
267.	Species confined to N. India. Abdominal segments 8 and 9 entirely blue above	*Drepanosticta carmichaeli.*
	Species confined to Burma. Abdominal segment 8 with its apical half and the whole of segment 9 blue	268
	Species confined to Ceylon. Segment 8 usually entirely black	269
268.	Abdomen 50 mm. in length; thorax on the middorsum metallic green	*Drepanosticta viridis.*
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269.	Abdominal segment 8 all black, 9 black marked with a large basal and a small apical blue spot.	*Drepanosticta tropica.*
	Abdominal segment 8 all black, its apical border and the whole of segment 9 blue	*Drepanosticta hilaris.*
	Abdominal segment 8 all black, 9 all blue	*Drepanosticta digna.*
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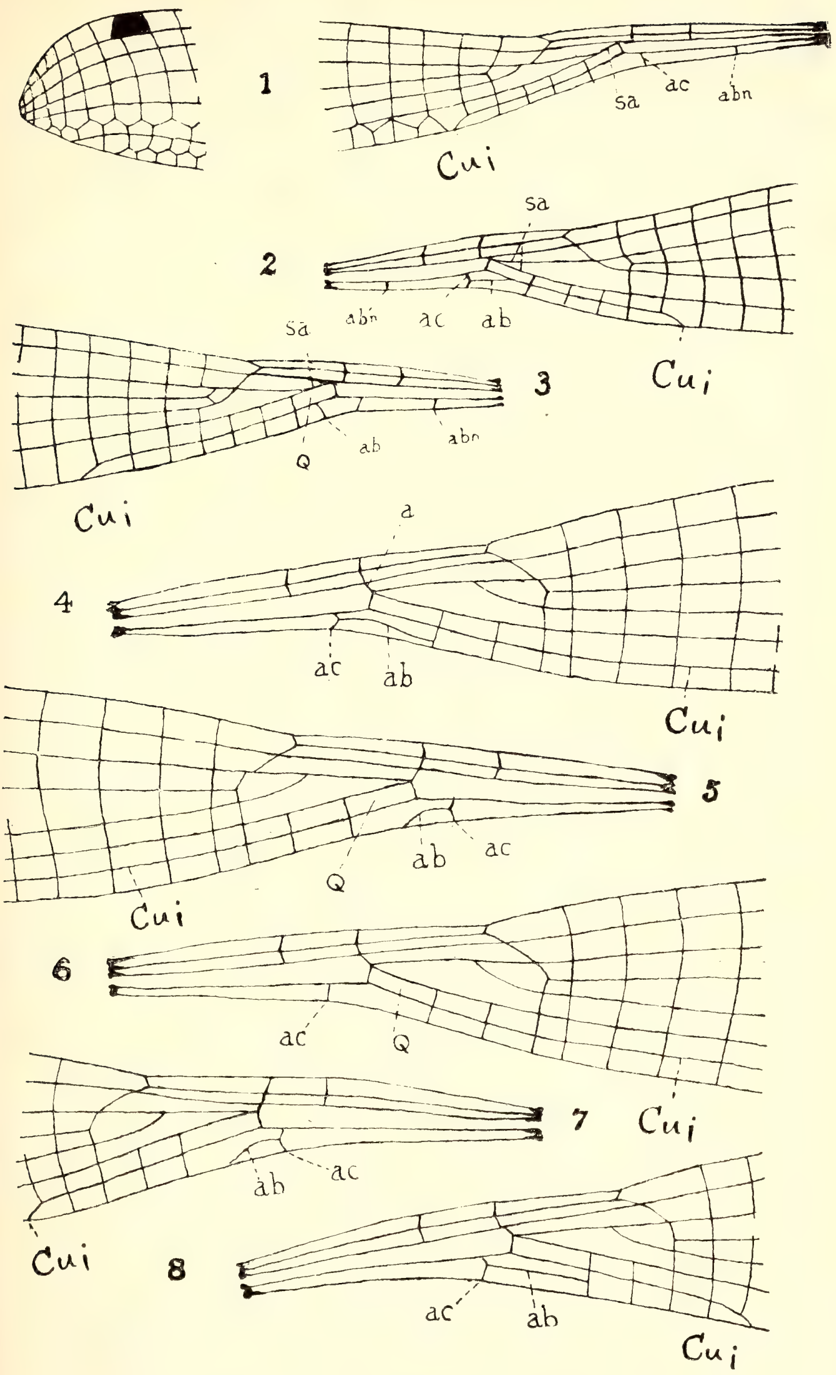
270.	Apices of all wings broadly black	*Platysticta apicalis.*
	Apices of all wings hyaline	271
271.	Thorax black marked with yellow; abdominal segments 8 to 10 blue on the dorsum	*Platysticta maculata.*
	Thorax bright reddish brown; only segments 8 and 9 blue on the dorsum	*Platysticta deccanensis.*
272.	The anal bridge complete (that is it runs from the nervure *ac* to meet the nervure descending from the outer end of quadrilateral)	273
	The anal bridge incomplete or absent (when incomplete its outer end curves down to meet the hinder border of wing before the level of the nervure descending from the outer end of quardrilateral	281
273.	Genus—*Chloroneura* :—	
	Wings of male coloured partly with blackish brown	274
	Wings of male uncoloured	275
274.	Apices of all wings broadly tipped with black	*Chloroneura apicalis.*
	All wings traversed by a broad blackish brown fascia about the middle	*Choloroneura quadrimaculata.*
275.	The nervure Cui reaching the hinder margin of wing at about half the length of wing. Comparatively large species, black marked with blue	276
	Genus—*Disparoneura* :—	
	The nervure Cui reaching the hinder margin of wing well before half the length of wing. Smaller species, varicoloured	277
276.	Genus—*Phylloneura* :—	
	Large species, abdomen about 50mm. in length; segments 7 to 10 marked with blue	*Phylloneura westermanni.*
	Genus—*Esme* :—	
	Smaller species, abdomen about 40mm. in length; segments 8 to 10 marked with blue.	*Esme cyaneovittata.*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DRAGONFLY COLLECTING IN INDIA.

For explanation see reverse.

EXPLANATION OF PLATE I.

a. The arc, *sa*. Sectors of arc, *ac*. The anal crossing known as nervure *ac*, *ab*. The anal bridge known as the nervure *ab*, *Cui* nervure running from lower and outer angle of quadrilateral. *Q* The quadrilateral, *abn*. The accessory basal nervure.

1 Apex and base of wing of *Protosticta*. Note that sectors of arc are fused at origin, the anal bridge is absent and that there is an accessory basal nervure.

2. Base of wing of *Platysticta*. Note that the sectors of arc are separated at their origin, that the anal bridge is present running from *ac* to the underside of quadrilateral and that there is an accessory basal nervue.

3. Base of wing of *Drepanosticta*. Note that the anal bridge is present running from the lower border of quadrilateral to hinder border of wing, the sectors of arc are fused at their origin and there is an accessory basal nervure.

4. Base of wing of *Esme*. Note that the anal bridge is present and complete. *Cui* is of great length.

5 Base of wing of *Indoneura*. Note that the anal bridge is present but incomplete. *Cui* is of great length.

6. Base of wing of *Melanoneura*. Note that the anal bridge is absent. *Cui* is of great length.

7. Base of wing of *Caconeura*. Note that anal bridge is present but incomplete. *Cui* is very short. (The bridge is often absent in this genus.)

8. Base of wing of *Disparoneura*. Note that the anal bridge is present and complete and that *Cui* is very short.

277. Species confined to Ceylon 278
Species confined to South and Central India 279
Species confined to N. E. India and Burma 280

278. Thorax pulverulent blue; posterior border of prothorax rounded .. ..*Disparoneura cæsia.*
Thorax black with two yellow stripes on the sides; posterior border of prothorax notched on either side .. ..*Disparoneura centralis.*
Thorax black marked with two red stripes on the back and a red and yellow stripe on the sides .. ..*Disparoneura tenax.*

279. Thorax black, pruinosed on the sides and beneath. Superior anal appendages obliquely truncate as seen in profile. Found in open sunlit places beside streams. .. .. ..*Disparoneura nigerrima.*
Thorax black (with pale yellow stripes on the dorsum of thorax in recently emerged specimens). Superior anal appendages bifid as seen in profile. Found in dark shady spots on covered streams .. ..*Disparoneura tetrica.*

280. Thorax black marked with blue .. *Disparoneura campioni.*
Thorax black marked with red . .. *Disparoneura fletcheri.*
Thorax black marked with yellow .. *Disparoneura atkinsoni.*

281. The nervure Cui reaching hinder margin of wing at about half the length of the wing.. 282
Genus—*Caconeura* :—
The nervure Cui reaching the hinder border of wing well before half the length of the wing 284

282. Genus—*Melanoneura* :—
The anal bridge (*ab*) absent .. .. ..*Melanoneura bilineata.*
Genus—*Indoneura* :—
The anal bridge present but always incomplete 283

283. Species with abdomen 36 mm. in length. Confined to the grassy uplands of the Nilgiris at about 7,000 ft. .. .. *Indoneura gomphoides.*
Species with abdomen 44 mm. in length. Found in forests not above 6,500 feet in the Nilgiris, Coorg and South Canara .. .. ..*Indoneura ramburi.*

284. The anal bridge always present but incomplete 285
The anal bridge always absent 286

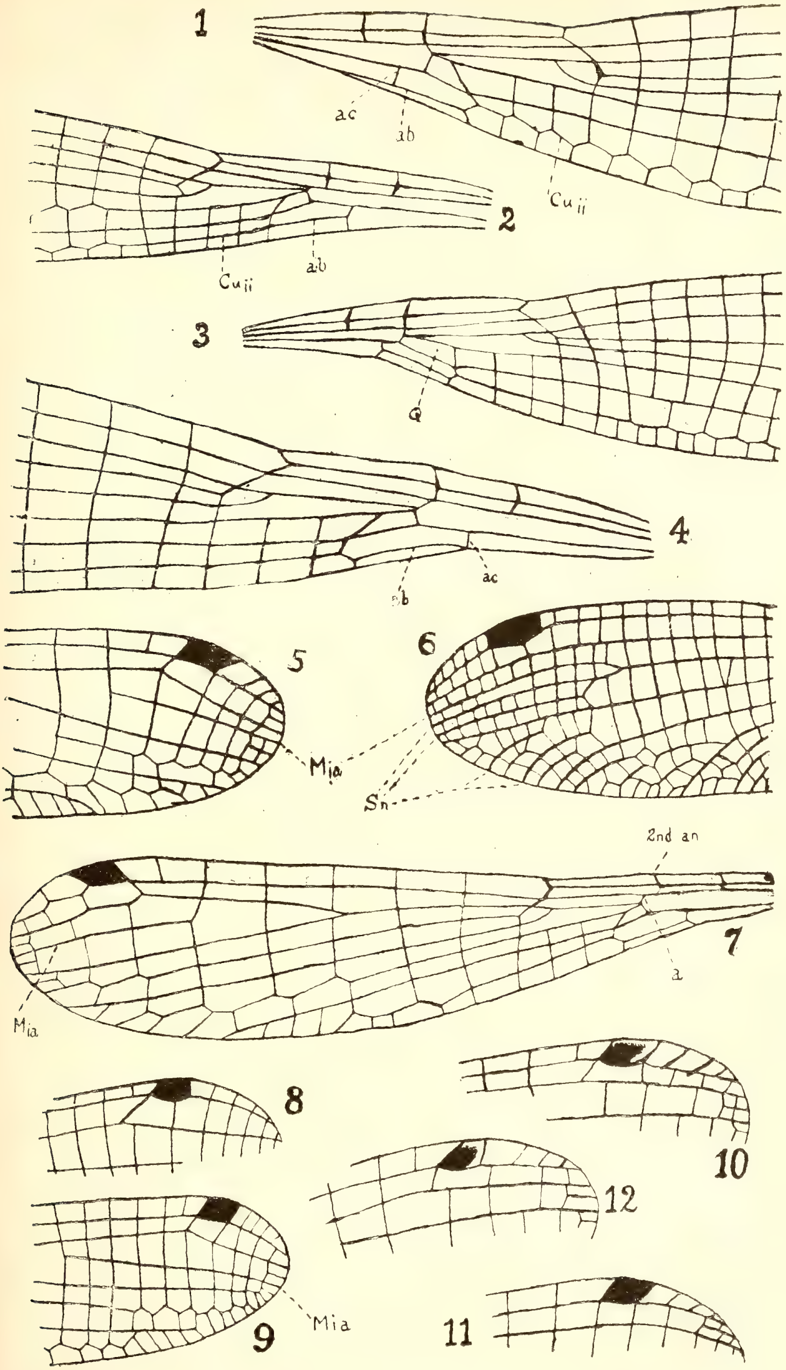
285. Thorax black with a broad blue triangular mark on each side of the dorsum. (Burma) .. ..*Caconeura botti.*
Thorax metallic purple marked obscurely with yellow on the sides .. ..*Caconeura mackwoodi.*
Thorax black marked with red 287
Thorax black marked with creamy white or yellow 288
Thorax black, unmarked or very obscurely so 289

286. Thorax black marked with azure blue .. ..*Caconeura theebawi.*
Thorax black unmarked .. .. ..*Caconeura o'doneli.*

287. Postnodal nervures in forewing 13 to 15 ..*Caconeura anandalei.*
Postnodal nervures in forewing numbering 17..*Caconeura verticalis.*

288. Thorax bronzed black marked with a white shoulder stripe and a broad lateral band ..*Caconeura sita.*
Thorax black marked with two lateral yellow stripes .. ..*Caconeura canningi.*

289.	Thorax entirely black; 15 postnodal nervures in forewing	..*Caconeura nigra.*
	Thorax black, marked with two lateral brownish white stripes. Only 13 postnodal nervures in forewing	..*Caconeura autumnalis.*
290.	Subfamily—*Megapodagrioninæ* :— Several supplementary nervures present in addition to *Mia*; stigma elongate, approaching that of *Lestes* in shape .. .. Genus—*Arigiolestes* One species only—	..*Arigiolestes melanothorax.*
	Subfamily—*Cœnagrioninæ* :— No supplementary nervures other than *Mia*; stigma very short, square or diamond shaped	291
291.	Upper and lower sides of quadrilateral about equal, the quadrilateral square at its outer end; hind tibiæ very broad and flattened	292
	Upper side of quadrilateral shorter than the lower, outer end of quadrilateral more or less acutely pointed; hind tibiæ not broadened or flattened	295
292.	Genus—*Platycnemis* :— Hind tibiæ broadened in both sexes; dorsum of thorax marked with metallic green bands	*Platycnemis latipes dealbata.*
	Genus—*Copera* :— Hind tibiæ broadened only in the males; no metallic bands on dorsum of thorax	293
293.	Tibiæ greatly dilated, white; inferior anal appendage much longer than superior and curved strongly down	..*Copera annulata.*
	Tibiæ moderately dilated, orange: inferior anal appendage four times as long as superior and directed straight back	..*Copera marginipes.*
	Tibiæ variable; inferior anal appendages only twice the length of the superior	294
294.	Tibiæ moderately dilated, bright greenish yellow	..*Copera vittata deccanensis.*
	Tibiæ only slightly dilated brown ..	..*Copera vittata vittata.*
295.	Quadrilateral with upper side two-thirds or more the length of lower. Most of the cells in wings four-sided	296
	Quadrilateral with upper side only half or less than half the length of lower, outer end acutely pointed. Many cells in wings five-sided	305
296.	Genus—*Cœliccia* :— The nervures *ac* and *ab* meet at the margin of the wing	297
	The nervure *ac* meets *ab* well away from the margin of the wing	298
297.	Segments 9 and 10 and the anal appendages black; two oval blue spots on lower part of front of thorax which may or may not be coalescent with a blue outer stripe; 18 to 24 postnodal nervures in forewing	..*Cœliccia renifera.*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DRAGONFLY COLLECTING IN INDIA.

For explanation see reverse.

EXPLANATION OF PLATE II.

1. Base of wing of *Onychargia.* Note that the arc is at the level of the 2nd antenodal nervure, that the quadrilateral is rather broader than usual, that *ab* meets *ac* well away from the wing margin and meets *Cuii* at an angle.

2. Base of wing of *Mortonagrion.* Note that the arc is distal to the level of the 2nd antenodal nervure, that the anal bridge (*ab*) is in a continuous straight line with *Cuii.* (This latter feature is also seen in *Indagrion.*)

3. Base of wing of *Calicnemis.* Note that upper and lower borders of quadrilateral are nearly equal and that the quadrilateral is subacutely pointed.

4. Base of wing of *Aciagrion* and *Pseudagrion.* Note that *ab* and *ac* meet at the wing margin.

5. Apex of wing of *Cœnagrion.* Note that there are no supplementary longitudinal nervures save *Mia.*

6. Apex of wing of *Argiolestes.* Note that there are many other supplementary longitudinal nervures in addition to *Mia.* The stigma is also rather elongated.

7. Wing of *Agriocnemis.* Note the position of arc, distal to the 2nd antenodal nervure.

8. Stigma of *Cœliccia.*

9. Diamond-shaped stigma of *Caconeura.*

10. Bicolorous stigma of forewing of *Ischnura.*

11. Unicolorous stigma of hindwing of *Ischnura.*

12. Bicolorous and unevenly shaped stigma of *Ischnura forcipata.*

297. Segments 9 and 10 and anal appendages yellow; two small blue spots on upper part and two larger oval spots of the same colour on lower part of front of thorax. Only 17 postnodal nervures in front wing .. .. ..*Cœliccia didyma.*

298. Genus—*Indocnemis*:—
Large species with abdomen 50 mm. in length; black marked with blue. Wings narrow, 35 mm. in length .. ..*Indocnemis kempi.*
Genus—*Calicnemis*:—
Smaller species with abdomen usually under 40 mm. in length; colours usually red and yellow (except *C. pulverulans* which is black marked with blue). Wings broader, generally under 30 mm. in length 299

299. Legs yellow or ochreous 300
Legs largely black 301

300. Abdomen entirely bright red.. .. .. *Calicnemis eximia.*
Abdomen bright red with the intersegmental joints black, segments 9 and 10 blackish ..*Calicnemis miles.*

301. Abdomen slender, 35 mm. in length 302
Abdomen stout, 30 mm. or less in length.. 303
Thorax black, unmarked .. ..*Calicnemis mortoni.*

302. Thorax black, marked broadly with chrome yellow .. ..*Calicnemis chromothorax.*

303. Thorax and abdomen black, the former with blue markings more or less obscured with pruinescence .. ..*Calicnemis pulverulans.*
Thorax black marked with yellow, abdomen bright red 304

304. Inferior anal appendages longer that the superior *Calicnemis miniata.*
Inferior anal appendages of same length as superiors .. ..*Calicnemis erythromelas.*

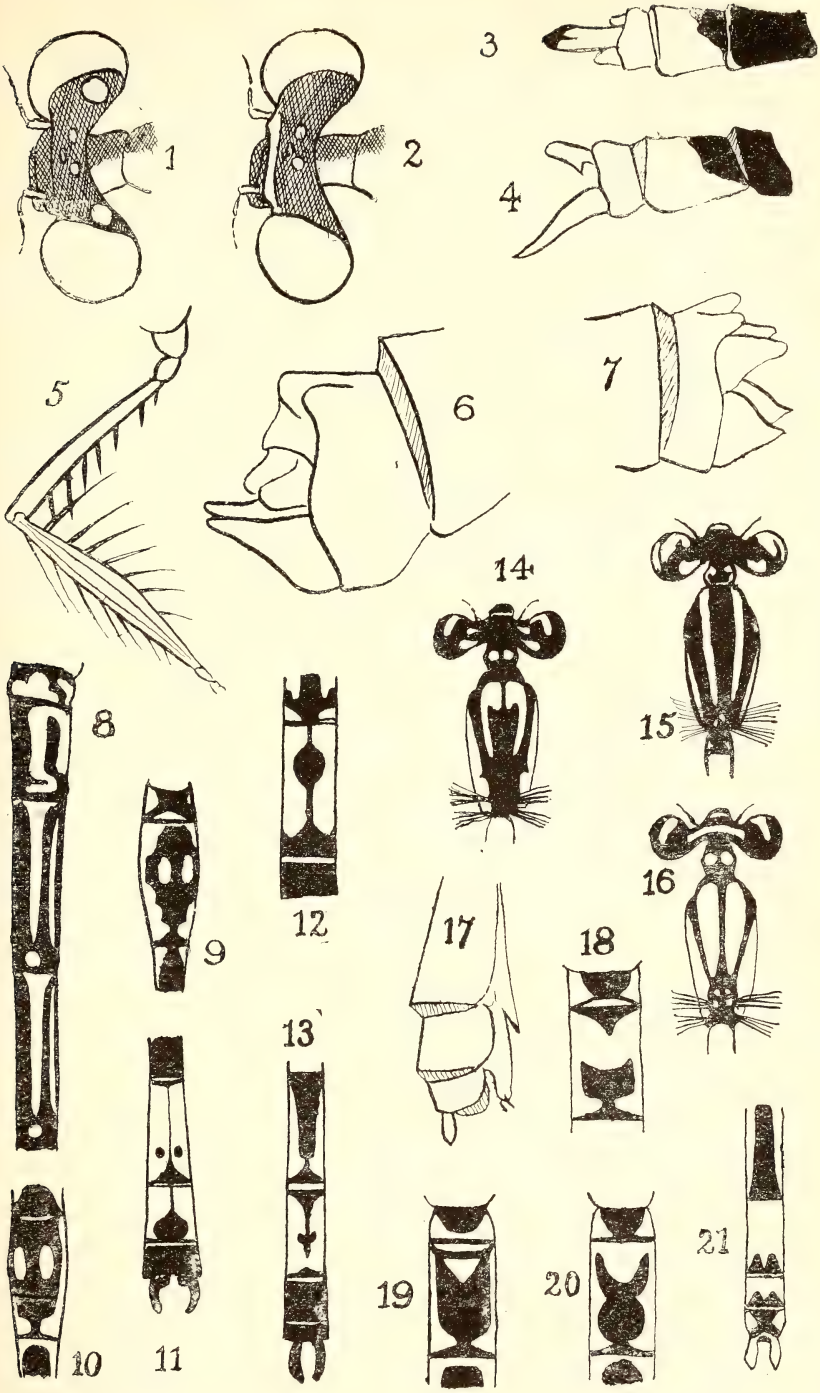
305. The nervure *ac* meets *ab* well away from the wing margin 305
The nervure *ac* meets *ab* at the wing margin or if slightly separated from it then the insects coloured palest yellow 335

306. A bifid tubercle on the hinder border of the 10th abdominal segment 307
No tubercle on the 10th abdominal segment 315

307. Genus—*Mortonagrion*:—
The arc well distal to the 2nd antenodal nervure *Mortonagrion varralli.*
The arc at the level of the 2nd antenodal.. 308

308. Genus—*Onychargia*:—
Stigma in fore and hind-wings similarly coloured; no rounded coloured spots behind the eyes; abdomen and wings approxmiately the same length .. ..*Onychargia atrocyana.*
Genus—*Ischnura*:—
Stigma of forewing differently coloured to that of the hind; a round coloured spot behind each eye usually blue in colour; abdomen considerably longer than the wings 309

309.	Abdominal segments 8 and 9 marked with blue	310
	Abdominal segments 8 and 9 unmarked with blue	314
310.	Segments 3 to 6 yellow, segment 3 unmarked, segments 4 to 6 unmarked or with only some small black apical markings	311
	Segments 3 to 6 with the whole of dorsum broadly black	312
311.	Thorax with the sides and a stripe on each side of the dorsum blue; segment 2 broadly black on dorsum; moderately sized species from Kashmir	*Ischnura inarmata.*
	Thorax with the sides and a stripe on each side of dorsum pale greenish yellow; segment 2 only finely marked with black on dorsum; very small species, abdomen 20 mm. in length or less	*Ischnura aurora.*
312.	Stigma of forewing with its inner side more oblique than the outer, its costal side much shorter than the posterior; segment 9 entirely blue	*Ischnura forcipata.*
	Stigma of forewing with inner and outer sides parallel, costal and posterior sides equal; segment 9 blue marked with black on the dorsum	313
313.	Segment 2 matt black on the dorsum	*Ischnura elegans.*
	Segment 2 metallic blue black on the dorsum ..	*Ischnura senegalensis.*
314.	Segments 1 to 6 bright orange, 7 to 10 black ..	*Ischnura annandalei.*
	Segments 1 to 7 and basal half of 8 bright orange, the remainder black	*Ischnura rufostigma.*
315.	The arc well distal of the 2nd antenodal nervure	316
	The arc arising at the level of the 2nd antenoda nervure	327
316.	Genus—*Indagrion*:—	
	The anal brigde (*ab*) and Cuii in a continuous straight line, that is their point of junction is not angulated	*Indagrion gautama.*
	The anal bridge and Cuii not continuous, their point of junction strongly angulated	317
317.	Genus—*Argiocnemis* :—	
	Large species, abdomen about 30 mm. long; 10 to 12 postnodal nervures in forewing	318
	Genus—*Agriocnemis* :—	
	Smaller species, adodmen not more than 20 mm. long, usually less than this; 6 to 8 postnodal nervures in forewing	319
318.	Abdominal segment 8 with blue markings on the sides only; segment 9, all blue, segment 10 blue with the dorsal ridge black	*Agriocnemis aborense.*
	Abdominal segments 8 and 9 all blue except for a fine black apical mark on the dorsum and an additional two small spots on segment 8 lying just in front of the apical marking ..	*Agriocnemis rubescens.*
319.	Upper lip metallic blue	320
	Upper lip non-metallic	321
320.	Superior anal appendages much longer than inferior	*Agriocnemis pygmae.*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DRAGONFLY COLLECTING IN INDIA.

For explanation see reverse.

EXPLANATION OF PLATE III.

1. Head of *Ischnura,* showing postocular coloured spots.
2. Head of *Ceriagrion,* showing the ridge on frons. No postocular spots.
3. Terminal segments and anal appendages of *Copera marginipes,* the inferior appendage much longer than the superior. Lateral view.
4. Terminal segments and anal appendages of *Copera annulata.*
5. Leg of *Copera* showing great dilatation of tibia.
6. End of abdomen of *Ischnura,* showing dorsal tubercles on segment 10.
7. End of abdomen of *Onychargia,* showing dorsal tubercles on segment 10.
8. First four abdominal segments of *Himalagrion exclamationis* seen from the side, showing markings.
9. Second abdominal segment of *Agriocnemis clauseni,* showing characteristic dorsal marking.
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11. Terminal segments of *Agriocnemis rubescens,* dorsal aspect.
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13. Terminal segments of *Agriocnemis naia,* dorsal aspect (subject to some variation).
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333. A pale pyriform spot behind each eye; thorax broadly black on dorsum with a blue stripe on each side. Female with 3 fine black lines on middorsum of thorax .. ..*Cœnagrion dyeri.*
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No ridge on front of head; a coloured spot or space usually present behind each eye 340

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337. Anal bridge meeting *ac* at a slight distance from the hind margin of wing; colour creenish yellow marked with black.. 338
Anal bridge meeting *ac* at the wing margin; colour variable 339

338. Superior anal appendages less than half the length of segment 10, quadrate inferior appendage directed upward .. .. ..*Ceriagrion melanurum.*
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339. Abdomen red at either end, the intermediate segments black; thorax green and blue ..*Ceriagrion cerinorubellum.*
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Abdomen olivaceous brown .. .. ..*Ceriagrion olivaceum.*
Abdomen bright orange .. .. ..*Ceriagrion rubiae.*
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342. Ground colour pale whitish brown; thorax with two poorly defined pale bluish stripes on each side; a large bluish spot behind each eye .. ..*Aciagrion pallidum.*
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Abdominal segments 1 to 7 blue, all marked broadly with black 346

346. Segments 8, 9 and 10, all black 347
Segments 8, 9 and 10 blue, at least some of them marked with black 348
Segments 8, 9 and 10, all blue 354

347. Thorax black with an olive coloured stripe on each side .. ..*Pseudagrion hypermelas.*
Thorax blue with a black line on either side of the middorsal ridge .. .. ..*Pseudagrion bidentatum*

348. Only segment 10 marked with black 349
Segments 8, 9 and 10 marked with black 353

349. Not less than 10 postnodal nervures in forewing 350
Not more than 8 postnodal nervures in forewing (occasionally 9 in some specimens of *Pseudagrion spencei.*) 352

350. Ground colour black heavily pruinosed with white on the sides and beneath of thorax .. ..*Pseudagrion pruinosum*
Ground colour azure blue, no pruinescence 351

351. A well marked apical black ring on segment 8; inferior anal appendages as long as segment 10 .. ..*Pseudagrion microcephalum.*

351. Only the apical row of spines on segment 8 black; superior anal appendages only half the length of segment 10 .. .. .. *Pseudagrion bengalense.*

352. Ground colour azure blue. Female with the black markings on abdomen very restricted and segments 3 to 6 usually unmarked .. *Pseudagrion spencei.*
Ground colour lilaceous. Female with broad black markings on abdomen, segments 3 to 6 always broadly marked .. .. .. *Pseudagrion laidlawi.*

353. Moderately large species, abdomen 33 mm. long; segments 8 and 9 with narrow apical black rings which extend forward on the dorsum of each segment as two tongue like points .. .. *Pseudagrion indicum.*
Smaller species, abdomen only 23 mm. long; segments 8 and 9 with broad apical black rings covering about one-fourth of the segments (Burma only.) .. .. *Pseudagrion williamsoni.*

354. Face and front of eyes pale greenish yellow .. *Pseudagrion decorum.*
Face and front of eyes bright orange .. .. *Pseudagrion rubriceps.*

GLOSSARY.

Ab.—The anal bridge. A small longitudinal nervure running from near the base of the wing and from its posterior border to join the nervure descending from the lower and outer end of the quadrilateral.

Abdomen.—The part of the body lying behind the thorax, composed of ten segments numbered from the thorax towards the anal end.

Ac.—The anal crossing. A small transverse nervure on the posterior border of the wing lying between the level of the two antenodal nervures and meeting the anal bridge when this is present.

Anal segments.—The end segments of the abdomen.

Antehumeral stripe.—Stripes on the front of thorax lying anterior and parallel to the shoulder region. Occasionally they run obliquely down and outwards.

Antenodal nervures.—Short transverse nervures lying between the costal margin of wing and the radius to the inner side of the node. They are numerous in all species except the *Cœnagrioninæ.*

Apical.—The part furthest removed from the thorax.

Arc.—The short transverse nervure from which the nervures *Mi-iii* and *Miv* take origin. Situated near the base of the wing at the upper and inner angle of the trigone or quadrilateral.

Auricles.—Small ear-like processes springing from the sides of the 2nd abdominal segment in some of the *Anisoptera.*

Basal.—The part nearest the thorax.

Basal antenodal nervure.—The antenodal nervure lying nearest the base of wing and occupying only the posterior half of the space. Only found in the *Gomphinæ.*

Basal space.—The space lying internal to the arc. The arcular or prearcular space.

Braced.—A term applied to the stigma when it has an oblique nervure running back from its inner end.

Crest of frons.—The front edge of the forehead.

Cubital nervure.—Short transverse nervures traversing the cubital space in the *Anisoptera.* Usually single but sometimes multiple.

Cubital space.—The space to the inner side of trigone.

Cui.—The nervure running outward from the lower and outer angle of trigone or quadrilateral.

Cuii.—The nervure running parallel to and behind *Cui.*

Dentigerous plate.—A spiny or forked plate found beneath the anal end of the abdomen in the females of *Æschninae.*

Discoidal cell.—The trigone or quadrilateral.

Discoidal field.—The area lying between the outer side of the trigone and the posterior border of wing, bounded in front by *Miv* and behind by *Cui.*

Divaricate.—Diverging.

Dorsal mesothoracic triangle.—A triangular area enclosed by a splitting of the middorsal ridge of the thorax in *Rhinocypha* males.

Dorsal thoracic stripe.—Antehumeral stripe, which see.

Dorsum.—The back.

Epistome.—The part of the face just above the upper lip and corresponding to the position of the nose.

Fascia.—A broad belt of colour.

Femur.—The upper part of leg.

Frons.—The forehead. Upper part of face and fore part of head in the *Anisoptera.*

Front of thorax.—The upper sloping part.

Humeral stripe.—A longitudinal stripe crossing the shoulder of thorax from behind forwards.

Hyaline.—Clear, transparent.

Hypertrigone.—The narrow triangle situated above the trigone in the *Anisoptera.*

Labium.—The lower lip.

Labrum.—The upper lip.

Lamina.—A broad plate lying in front of the genitalia of the male on the second segment.

Lobe.—A sac-like organ lying posterior to the genitalia of the male on the second segment.

Loop.—A cluster of cells varying in shape and length lying posterior to and behind the trigone in the hindwing of most *Libellulidæ.*

Median space.—The basal or prearcular space.

Mesothoracic triangle.—See *Dorsal mesothoracic triangle.*

Mia—A short longitudinal nervure at the apex of wing.

Node.—The false joint about the middle of the costal margin of wing.

Occiput.—The space lying between the eyes and at back of head.

Posterior lobe of prothorax.—A collar-like scale situated on the posterior border of the prothorax.

Postnodal nervures.—Short transverse nervures lying to the outer side of node and between the costal margin of wing and the nervure running parallel to it.

Postocular spots.—Rounded or subrounded spots of colour lying behind and to the inner side of eyes in many species of *Cœnagrionines.*

Pruinosed.—Coated with a more or less dense white or bluish bloom.

Quadrilateral.—The four-sided area at the base of wing below and to outer side of arc in the *Cœnagrionidæ.* The discoidal cell. Corresponds to the trigone of the *Anisoptera.*

Sectors of arc.—The two nervures springing from the arc.

Subapical.—Near the apex.

Subbasal.—Near the base.

Subdorsal.—Near the dorsal ridge.

Subtrigone.—A small triangular area below and behind the trigone of the *Anisoptera*

Stigma.—The pterostigma. An opaque area on the costal margin of the wing near the apex, nearly always present but sometimes absent in one or both sexes.

Supplementary basal nervure.—A small transverse nervure on the posterior border of the wing proximal to the anal crossing (ac.), only found in some *Protoneurinae.*

Tibia.—The foreleg.

Tibial spines.—Spines lining both borders of the tibiæ.

Ventral.—Beneath. The belly-side.

Vesicle.—A small eminence found on the upper and fore part of head, lying just behind the ocelli in the *Anisoptera.*

Vitreous spots.—Iridiscent clear areas found on the wings of most species of male *Rhinocyphas.*

FEMALE DRAGONFLIES.

In the above key only the male dragonfly has been dealt with, little or no attempt has been made to deal with the females.

It must be borne in mind that the latter, more often than not have the wings uncoloured even in cases where the male wings are coloured; venation however is nearly always identical in the two sexes and must be relied upon as the chief means of determining the species of any particular female.

In some genera of the *Zygoptera* there are two or even three varieties of the female, which renders the task of identification very puzzling.

The chief differences met with between the two sexes may be summed up in the following rules :—

1. The male genitalia are conspicuous on the underneath of the 2nd abdominal segment whilst the female carries her organs below the 8th and 9th segments.
2. The anal appendages of the female are very small and inconspicuous as compared to those of the male.
3. The abdomen of the female is much stouter and less shapely than that of the male.
4. The wings of the female are nearly always uncoloured and modified in shape; in the *Anisoptera* the anal angle of the hindwing is rounded off instead of strongly angulated as is the case usually in the male. In the larger species of *Zygoptera* the fore and hind-wings are of the same shape and width.
5. Colouration is usually more dull and inconspicuous. Where the abdomen of the male is some shade of red or blue, that of the female will be some shade of yellow or brown, or if marked in the male, the corresponding markings in the female will be much more in evidence hiding or obscuring the ground colour.

A newly emerged male, especially of the *Libellulinæ* closely resembles the female in colouring, the blues and reds are not developed for several days. Thus a female may often be determined by comparing it with a newly emerged (teneral) male.

In the larger species of *Zygoptera* the body markings of the females are better developed, in the *Rhinocypha* however, the coloured mesothoracic triangle of the males is absent in the females.

In the following notes I have endeavoured to deal with striking and individual differences between the sexes of certain species, showing how the females of such may be identified.

Tetrathemis platyptera.—Wings uncoloured.

Orthetrum.—All females have the body and abdomen some shade of yellow or brown. Venation is usually true.

Rhodothemis rufa.—Abdomen ochreous or brownish yellow. A pale greenish yellow stripe runs from front and dorsum of thorax unbrokenly on to the first few segments of abdomen.

Indothemis.—Females yellowish, marked with black.

Tholymis tillarga.—Female without the opalescent white spot on hind wings. Body colour brownish olive.

Diplacodes nebulosa.—Black apices of wings absent. Body colour pale yellow marked with black.

Sympetrum.—Where males have red bodies the females are yellowish.

Neurothemis fulvia.—Female differs markedly from the male. The colour is pale amber and the hyaline spaces at the apices of wings are nearly always absent. When present they are small and poorly defined.

Neurothemis fluctuans.—Wings usually colourless but occasional specimens resemble the male.

Neurothemis tullia tullia and *tullia feralis.*—Females totally different from the males, so much so in fact that they were for a long time taken to be two different species. The two sexes are usually found swarming together in marshes. The base of the wing as far as node pale saffron, a broad brown fascia traverses the wing at the level of the node and the apices are coloured broadly with the same colour.

Lathrecista asiatica.—Abdomen rich ochreous in the female. I have only once taken a female with the abdomen coloured bright red as in the male.

Brachythemis contaminata.—Wings without the orange bands.

Crocothemis servilia.—Females sandy yellow.

Trithemis aurora.—Females yellow marked with black, abdomen cylindrical, wings with brown apices.

Trithemis festiva.—Very similar to *aurora* but the apices not tipped with brown.

Azuma and *Macromia.*—Females with broad compressed abdomen. Yellow markings broader and better defined.

Idionyx.—Same as last but the wings often broadly saffronated at the base.

Orogomphus xanthoptera.—The description in the key is that of the female, the wings of the male are colourless and narrow. Found only in the Western Ghats.

Mnais earnshawi.—Wings of female colourless, stigma usually absent.

Neurobasis chinensis.—Wings deep saffron in the female, the node and false stigma opaque white. No metallic colouring on wings.

Anisopleura.—The angulation of the costa in the hindwing is absent so that they are apt to be confused with *Bayadera.*

Caliphaea confusa.—Wings colourless, thorax green metallic, no parts of body pruinosed.

Pseudophæa.—All females remarkably alike. Wings similar in shape and narrow, uncoloured or with the apices indifferently tipped with brown. Markings of body better defined but of the same pattern as in the males.

Rhinocypha and *Micromerus.*—Wings colourless. Stigma always present and well formed. Coloured mesothoracic triangle absent. Unless taken in company with the male, females of *Rhinocypha* offer the greatest difficulty in identification, as they resemble each other so closely.

Protoneura.—Females are much shorter and stouter than the males, but markings are very similar.

Chloroneura.—Females have the wings colourless.

Disparoneura and *Caconeura.*—In males where the body markings are red, the corresponding females are marked with yellow.

Copera.—Females more sombre, legs pale brown, abdomen stouter and shorter.

Calicnemis.—The differences here are best expressed by means of a key. The one given is a modification of Laidlaw's.

1.	Legs yellow ; dorsum of abdomen bronze green	*C. eximia.*
	Legs black ; dorsum of abdomen black	*C. mortoni.*
	Legs black marked with yellow	2
2.	Abdomen yellow marked with black	3
	Abdomen crimson	4
3.	Whole of abdomen black or the basal segments yellow marked with black	*C. pulverulans.*
	Abdomen black, terminal segments bright yellow	*C. chromothorax.*
	Abdomen yellow clouded with black throughout	*C. miles.*
4.	Upper lip black	*C. erythromelas.*
	Upper lip reddish brown	*C. miniata.*

Cœliccia.—Dorsal markings on thorax a plain outer stripe of yellow on each side.

Ischnura.—Nearly all the species of this genus have at least two distinct types of female which usually differ very markedly from the males. Except in the orange type of female, the head and thorax closely resemble the male. Fortunately it is rare to take any two species in the same locality except *I. senegalensis* and *I. aurora* and here the differences in size are so marked that there is no difficulty in separating the two.

I. inarmata.—Three types of female.

1. Thorax bright orange without any black marking.
2. Head and thorax closely resembling male. Ground colour pale blue, all segments marked broadly on dorsum with black. Middorsal ridge of thorax finely yellow.
3. Similar but the ground colour palest brown.

I. aurora.—Ground colour orange or ochreous, all abdominal segments broadly black on dorsum. No blue marks.

I. forcipata.—Females resemble those of *senegalensis* but no orange female is known although it probably exists. Stigma pale brown and diamond shaped in all wings.

I. elegans.—Two types of female known. One resembling the male very closely and an orange form closely similar to that of *senegalensis.*

I. senegalensis.—Three types of female known.

1. Exactly similar to the male.
2. An orange form with the thorax bearing a broad median black stripe.
3. Ground colour dirty brown, abdomen marked broadly with black throughout.

I. annandalei and *I. rufostigma.*—Females resemble males closely except that all segments of abdomen bear traces of black.

Agriocnemis and *Argiocnemis.*—Females of these are markedly polymorphic. All species have a reddish coloured female which represents the newly emerged insect and from this all grades of colouring are met with to the adult insect.

These red females are the analogues of the orange females of *Ischnura.* In the adult insect, the abdomen is broadly marked with black but the head and thorax do not differ markedly from that of the respective males. so that there is usually not much difficulty in determining them.

A. incisa.—This species has a pale citron yellow type of female and an equally common rose-pink type. The former has the thorax unmarked, the latter bears a broad, median black stripe on the dorsum.

Rhodischnura nursei.—The female is dimorphic. One type is similar to the male but is rare. The common type is not unlike the female of *I. aurora* but there is only a single broad band of black on the dorsum of thorax and no enclosed stripes of the ground colour. A third type has the thorax similar but the abdomen red marked finely with black on segments 1 to 6, and broadly from 7 to 10.

Cœnagrion dyeri.—The ground colour of the female is pale grey, the thorax bearing 3 fine parallel black lines on the middorsum and the abdomen marked broadly with black throughout.

Ceriagrion.—Both sexes usually similar but the females more sombre. *C. fallax* and *C. melanurum* have the abdomen broadly marked with warm brown changing to deep black on segments 6 to 10. *C. coromandelianum* has the abdomen olivaceous brown and may be confused with *olivaceum.* Other species are usually taken in company with their respective mates.

Enallagma and *Aciagrion.*—Sexes closely similar but the blue shoulder stripes are pale greenish yellow in the females.

Pseudagrion.—The females of these are very confusing as they differ widely in colour from that of the males and bear a more or less close resemblance to each other.

I have thought it best to make out a key for these but as they are usually taken paired with the males, the characters of these should be relied upon for determining the species.

1.	Thorax with only a single fine middorsal black line	2
	Thorax with 3 fine parallel black lines on middorsum	3
2.	Ground colour pale blue; black marking on dorsum of segment 9 split into two apical points	*P. microcephalum.*
	Similar but a deeper blue..	*P. bengalense.*
	Ground colour pale green; 9th segment with a broad, quadrate black mark	*P. decorum.*
3.	Black markings on segments 2 to 6, very narrow and restricted	*P. spencei.*
	Black markings on segments 2 to 6, very broad and covering most of dorsum	4
4.	More than 10 postnodal nervures to forewing ..	5
	Less than 10 postnodal nervures to forewing ..	8
5.	More than 12 postnodal nervures to forewing ..	6
	Not more than 12 postnodal nervures to forewing	7
6.	Segment 8 all blue	*P. azureum.*
	Segment 8 all black	*P. pruinosum.*
7.	Segment 8 all black; 11 postnodal nervures to forewing	*P. rubriceps.*
	Segment 8 black marked with a blue apical ring, 12 postnodal nervures to forewing	*P. indicum.*
8.	Ground colour of thorax violaceous brown; segment 10 unmarked; 8 postnodal nervures to forewing	*P. laidlawi.*
	Ground colour of thorax pale greenish yellow; segment 10 with a basal mark of black; 9 postnodal nervures to forewing	*P. hypermelas.*

ERRATA.

Part II.

Page 53, lines 5 and 10 from top of page, *Cuii* should be *Cui.*

Page 54, line 11, the figure 6 should be 8.

Page 58, line 8, *Macromiaida* should be *Macromia ida,* and on lines 41 and 47, *Indomacromia* should read *Phyllomacromia.*

Page 59, fifth line from bottom, *specious* should read *speciosus.*

Page 65, lines 4 and 7, the word *biforceps* should be omitted.

Part III.

Page 474, line 3 from bottom of page, the letter *B* should read *D.*

Page 475, lines 15 and 16 from bottom of page, *subfamily* should read *family.*

Page 478, line 2, from top of page, *Pseudophaea etheli* should read *Dysphaea ethela.*

Page 479, line 27, the word *perforata* should be omitted.

Page 480, line 12 from bottom of page, the word *praemorsa* should be omitted.

A DESCRIPTION OF THE NESTS AND EGGS OF THE COMMON BIRDS OCCURRING IN THE PLAINS OF THE UNITED PROVINCES.

By

E. H. N. Gill.

Part iv.

(*With* 3 *plates.*)

(*Continued from page* 344 *of this volume.*)

Pratincola caprata (608)	The Common Pied Bush-Chat.
Local name	Kala Pidha.
Anglo-Indian name	The Pied Robin.

This species seems to have a curious distribution, in that it is comparatively common in some districts, and rare in others. It seems to occur more abundantly in wild, open country; and is very common in the hilly, scrub covered tracts of the Mirzapur, Allahabad, Banda and Jhansi districts; and in the wilder portions of the Rohilkhand division. In the Eastern districts it is rare, and is seldom met with. I cannot remember ever having seen it East of Benares.

The breeding season is from March to June, though the majority lay in March and April. The nests are shallow, saucer-like structures composed of soft grasses, fine roots, and wool; lined with hair and other soft materials; placed in holes in walls or banks quite near the ground; the entrance being carefully sheltered externally. Sometimes the nests are in dense bushes or tufts of grass, but always close to the ground. The birds are shy and wary, and as the nests are well concealed, a great number escape detection. Two nests of unique type taken by Colonel Marshall at Saharanpur are worthy of mention. "They were situated", he says, "in the middle of tufts of surkery-grass, the insides of which had been all hollowed out, so as to leave a circular space of bare ground in the middle about a foot in diameter, which was sparsely covered over with bits of grass; this circular space was roofed over by drawing the surrounding grass-stems together and weaving in other pieces so as to form a sort of dome. The interior height of the structure was about 18 inches. The entrance was circular on one side near the top, about 15 inches above the floor of the chamber. The egg-receptacle was a hollow in the floor of the chamber near one side farthest from the entrance and neatly lined with grass, about 2¼ inches across, and about 1¼ inch deep."

Normally only four eggs are laid in shape rather broad ovals slightly pointed towards one end, and fairly glossy. The ground-colour is a delicate pale greenish blue, and the markings consist of specks, streaks, and splashes of reddish brown scattered over the egg, and having a tendency to collect in an irregular cap at the large end. In some specimens the streaks and splashes predominate, and in others only the speckles; and a normal egg would measure about 0·65 by 0·56 inch.

Cercomela fusca (629)	The Brown Rock-Chat.
Local name	Shama.
Anglo-Indian name	The Sharma.

This is a common bird throughout the Province, and is peculiar for its curious attachment for old ruins, buildings, forts, mosques, temples, and quarries. It bobs up most unexpectedly in the wierdest places and darkest corners where its haunting voice and dull, sober colouring strikes a note of unspeakable loneliness. Summer and winter they haunt the same buildings and are never absent from the vicinity of their breeding grounds; in some cases becoming so domesticated as to be almost handled. A pair have been breeding in the Bareilly Club for several years, and at the present moment are so tame, that they hop cheerfully about the various rooms without the least fear of molestation.

The breeding season is from March to July, and the nests, always placed in holes or crevices in walls or rocks, are feeble structures of fine grasses, roots, and wool, scantily lined with horse-hair and soft materials, with a slight depression in the centre to contain the eggs. Occasionally the nest is placed on a flat surface or ledge projecting from under a roof, and then it is encircled with small lumps of earth or pebbles to prevent the eggs from slipping off the edge. There are two, and sometimes three broods a year.

Normally only three eggs are laid, only occasionally four. In shape they are, typically, moderately broad ovals somewhat pointed towards one end. The ground-colour is a pale pure blue sometimes spotless, but generally sparingly spotted and speckled with different shades of red, particularly towards the large end; the small end being almost free from any markings. A normal egg would measure about 0·8 by 0·6 inch.

Thamnobia cambaiensis (661) .. The Brown-backed Indian Robin.
Local name .. .. .. Unknown.
Anglo-Indian name .. .. The Indian Robin; Dhama.

This species is extremely common throughout the Province, and a familiar garden bird in practically every district. It is essentially terrestrial in its habits, and is quite interesting to watch as it hops about the garden in a most sprightly manner with its little tail held erect, expanding and contracting it at frequent intervals.

The period of nidification is from March to July, according to locality; and the nests are always placed in holes in walls and earthen banks quite near the ground. The holes in stable and gate pillars, when the bamboo cross poles are not in use, are favourite nesting places, and many a nest may be found therein. The nests are merely soft pads of tow, sheep's wool, and vegetable fibres, with the egg-cavity in the middle; sometimes deep and sometimes shallow, lined with fine roots and horse-hair. Quite frequently nests may be found wedged firmly between the stiff, upright stems of cactus bushes, and these are simply compact masses of the same materials with a cup-shaped and hair-lined egg-cavity let in on top. But this is not all, for the birds are not without a sense of humour, and are not above contemplating the possibilities of disused drain-pipes, broken flower pots, old tin cans, and the like, as highly desirable nesting sites.

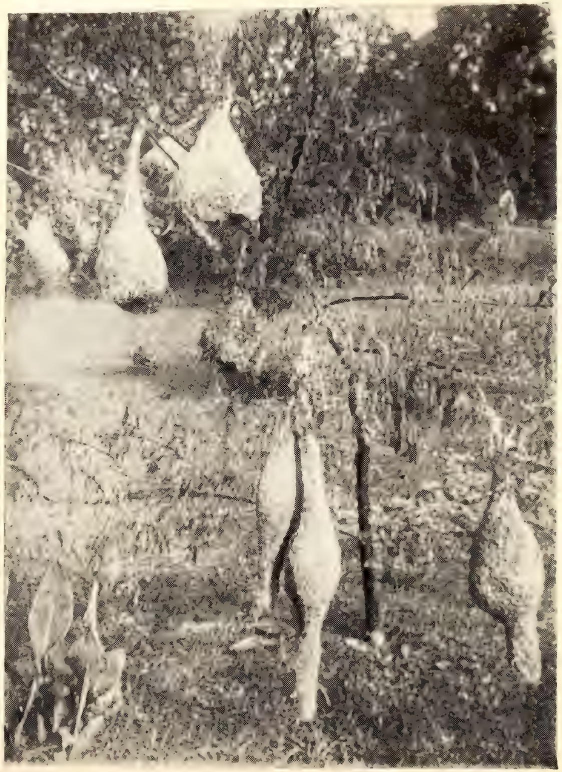
The usual complement of eggs laid is three, occasionally four. Two and three broods are raised each year, sometimes in the one nest. In shape the eggs are somewhat elongated ovals, more or less pointed towards one end. The ground colour varies from a cream, through shades of pink and pale brown, to a light-green, with a moderate gloss. The markings which are numerous, consist of specks and spots of a reddish brown scattered more or less profusely over the whole egg, particularly towards the large end, which in some specimens produce a distinct brown zone underlaid by secondary markings of pale purple shades. A normal egg would measure about 0·8 by 0·6 inch.

Copsychus saularis (663) .. The Magpie Robin.
Local name .. .. .. Dhiyal.
Anglo-Indian name .. .. Dhiyal.

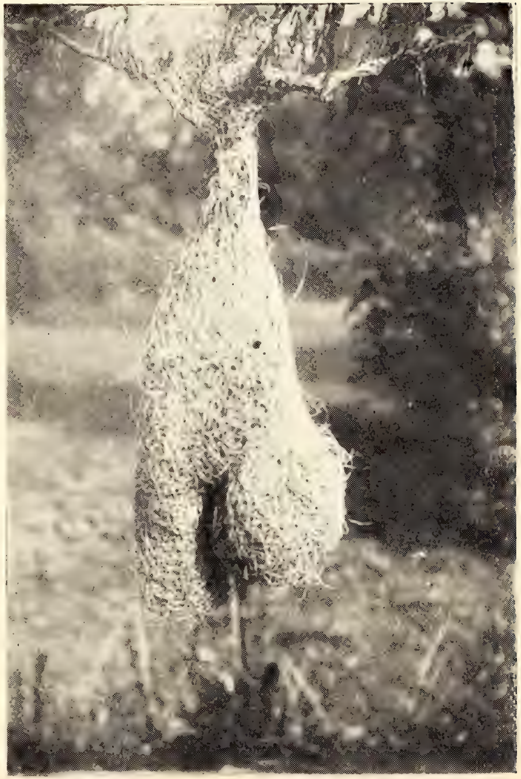
This conspicuous bird occurs in mostly all the districts of the Province, though less commonly perhaps than the Brown-backed Indian Robin. It is a familiar garden bird of pleasing song, especially in the breeding season when it may be observed in the early mornings perched high on the top of some leafless bough whistling and twittering in the most refreshing manner, and which, if not disturbed, it will continue for some considerable time.

The period of nidification is from about the beginning of April to about the beginning of August, according to locality, though the bulk lay in May and April.

NESTS OF THE COMMON WEAVER BIRD OR BAYA (*Ploceus baya*).



Showing both the "male" and "female" nest.



An abnormal nest—the nest of the male bird
is attached below the egg-cavity on the

The nests are invariably built in holes in trees, though holes in walls and mud banks are often selected. Both birds assist in building the nest and incubating the eggs, and are devoted parents.

The nest is simply a frail padding of fine twigs and various vegetable fibres occupying the bottom of the hole or cavity, slightly cup-shaped towards the centre to contain the eggs: the full complement of which is five, though it is more usual to find four, sometimes only three.

In shape they are typically almost perfect ovals with a moderate gloss, though the variation in shape is pretty wide; elongated, pyriform, and globular specimens being quite common. The ground-colour varies from a pale green, through darker shades of green, to a distinct greenish blue. The markings, which are usually more conspicuous towards the large end, consist of streaks and small blotches of reddish brown, underlaid by faint spots and mottlings of pale purple shades; more conspicuous in some specimens than in others. The eggs, as a whole, bear a remarkable resemblance to those of the Black-headed Cuckoo Shrike; and a normal specimen would measure about 0·86 by 0·65 inch.

Ploceus baya (720) ..	.. The Indian Baya, or Weaver-Bird.
Local name	.. Baya.
Anglo-Indian name ..	.. The Bottle-Bird.

The common Baya is a popular bird throughout India. It occurs commonly throughout the Province, but can hardly be characterised as a garden species. The birds are highly gregarious, and are usually met with in large numbers in cane-brakes and high cultivation. They are birds of considerable sagacity, and are popular with Indians on account of the way in which they can be trained to perform all manner of quaint tricks. They are very easily tamed, and become charming pets.

The period of nidification is from April to September, according to locality, and the nests, though wonderful structures, are perhaps even more familiar to the casual observer than the birds themselves. They occur most commonly in the immediate vicinity of water; the overhanging fronds of date and toddy palms, and the spreading branches of thorny acacias being specially favoured. Large bushes overhanging the borrow-pits alongside railway embankments, and even disused wells amidst high cultivation are common sites; and it is not out of the ordinary to find fifty or more nests on the one tree. They are pensile and retort shaped, and are composed throughout of fine strips of elephant grass or sugar-cane leaf without lining of any description, and are marvels of ingenuity and patience.

The upper part of the nest varies in length as also does the nest itself, and the long tubular entrance underneath. From the point of support the top portion is extended and widened till the roof portion, comprising about a third of the nest proper, is completed; at which stage a strongly woven loop is formed, attached to either side of the roof. The egg compartment is then formed on one side of the loop, but lower than the top of it—in order to prevent the eggs from rolling out, and the tubular entrance on the other. Both birds assist in building the nest, and are tireless in their continued efforts to acquire perfection. When the nest has assumed certain proportions the female takes up her position inside while the male supplies the materials from without, and though the strips of grass used for the purpose are much serrated, it does not seem to worry the birds in the least who thread it in and out of the nest fabric without the least difficulty. In fact, this is done so efficiently that it is very difficult to pull the nest to pieces, a fact which adds considerably to its stability.

The precise method by which the building material is obtained is most interesting. A bird alights on a stout blade of grass and bites through its edge to the required thickness. Then, with the bitten end held firmly in its bill, the bird flies off. The strip, of course, rips along the blade and snaps off at the end without in any way retarding the progress of the bird. A method which, apart from being quite ingenious, saves a deal of valuable time. Some observers have gone so far as to maintain that the blade is bitten in two places to the required length, but I have not actually observed this myself.

A most interesting feature about the nidification of this species is the small deposits of clay found in many of the nests. One idea, distinctly oriental but rather picturesque, is to the effect that the birds use the clay to stick fire-flies on to in order to light up the nest at night. Layard suggests that the bird uses it to sharpen its bill on. Burgess that it helps to strengthen the nest, and Jerdon that it serves to balance the nest correctly and to prevent its being blown about by the wind.

The deposits of clay are not present in all nests, and so far as my experience goes, I have found it more abundant in the incomplete nests which are supposed to be built by the males for their own special benefit. That there is a definite reason for this peculiarity is beyond question, and when one takes into consideration the fact that the clay is always stuck on at the one place, under the roof directly above the egg-compartment, it is not improbable to suppose that it serves to make the egg-compartment more waterproof, and also to make the roof stronger and more rigid and better able to withstand the extra weight of the young birds without getting out of shape and pressing down upon them.

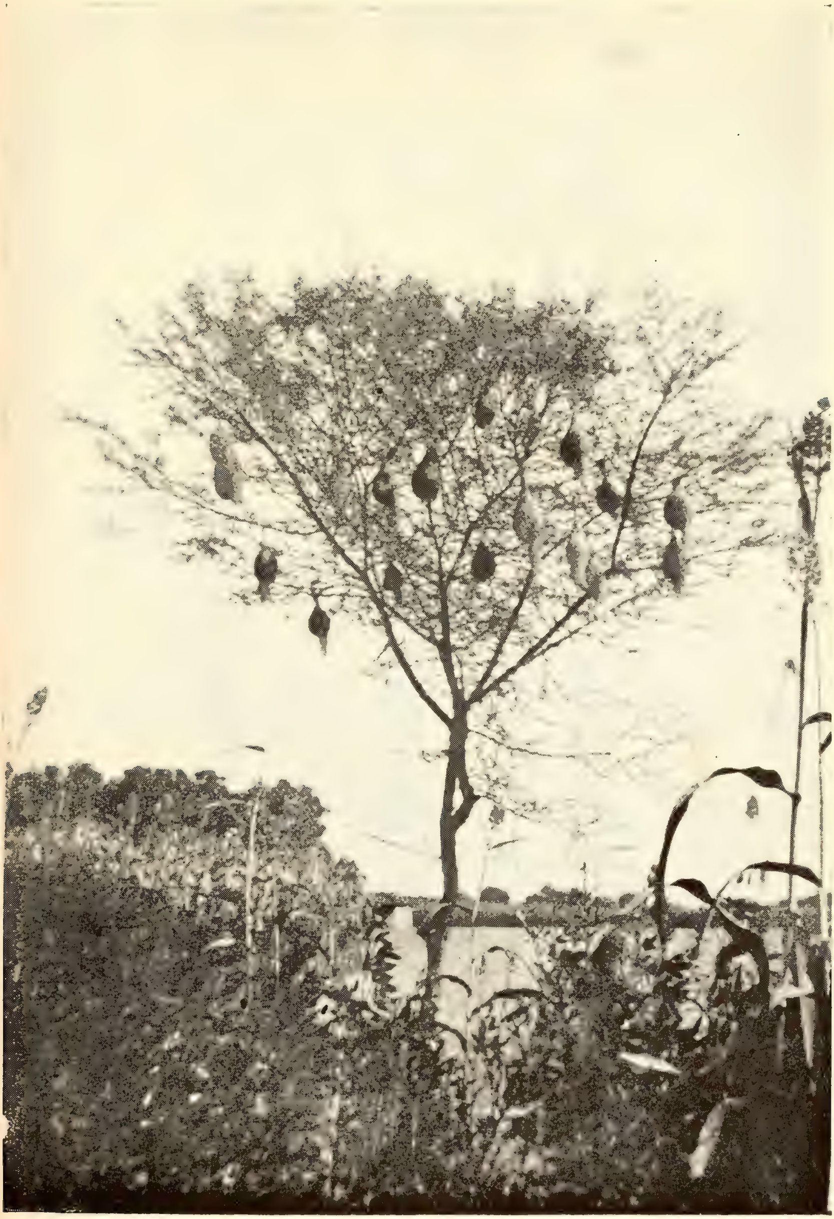
Then there is the extraordinary phenomenon attaching to the incomplete nests which are a feature of every breeding colony, in some more some less. It seems to be just the normal nest cut horizontally in halves with a transverse loop at the bottom on which the male bird takes up his position. Jerdon, however, maintains that they are just ordinary unfinished nests which have been rejected either for some imperfect construction, weak support, or other reason; but there would seem to be more in it than this. Not so very long ago I watched a lone male Baya build one of these "unfinished" nests entirely for himself; but not being in possession of a mate he was obviously aware of the futility of completing it.

Even in the breeding colonies the males go on building and titivating the completed nests long after the eggs have been laid, especially the tubular entrances which sometimes attain to a length of about 12 inches. As a matter of fact the constructive faculty at this season appears to be so strong that the males seem to be smitten by an overmastering desire to keep on building something and this is borne out by the fact that the incomplete nests are of greener material. What is more desirable than a comfortable nest of simple design for themselves?

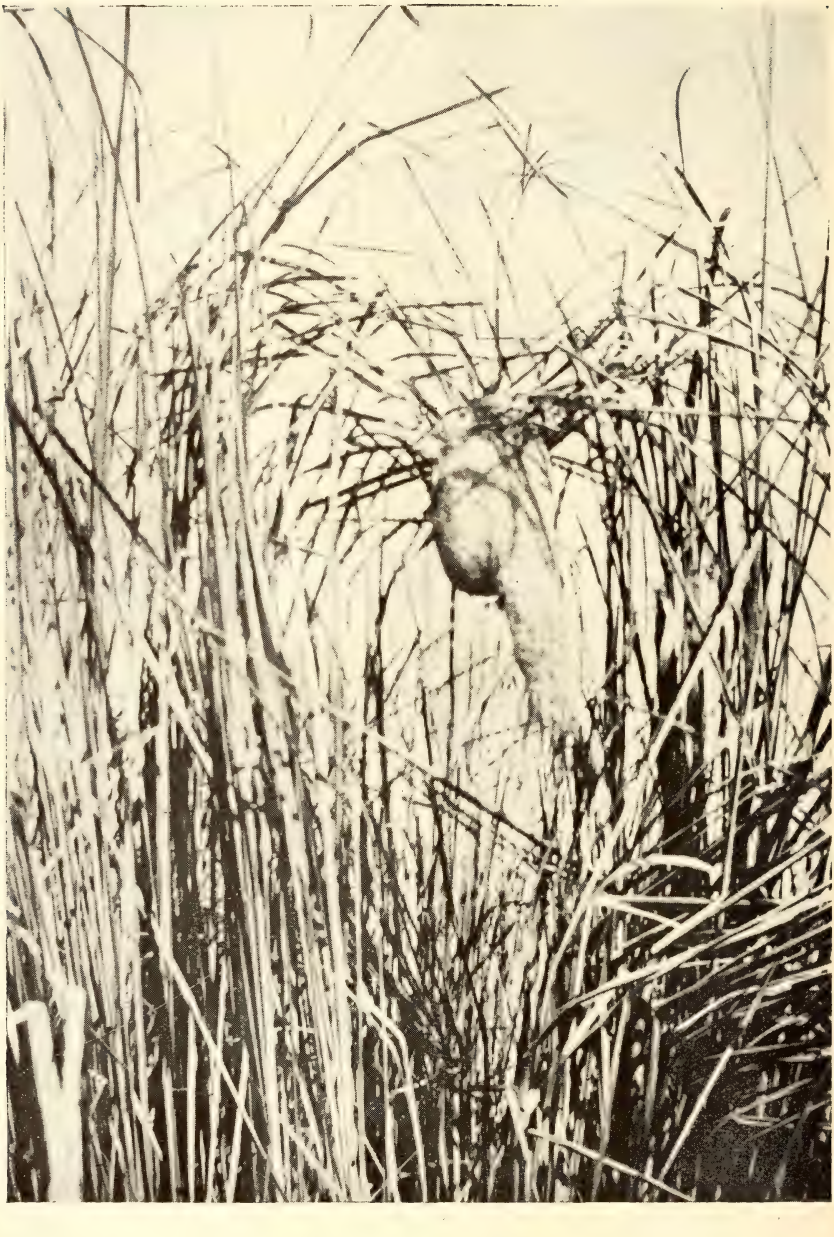
The tubular entrance itself is obviously designed for purposes of safety, as anyone who has tried to extract the eggs from one of these nests will readily acknowledge. No other bird could possibly accomplish it without tearing the nest to pieces, and even this is not an easy task. But the way in which the birds themselves dash up the tubular entrance without even shaking the nest, or pushing their heads through the roof with the impetus they acquire, is perfectly marvellous, and a sight well worth watching.

The tubular passage is used as a mode of entrance while the nest is in process of construction, and while the eggs are being incubated. But shortly after the eggs are hatched it seems to be abandoned altogether and the food delivered to the claimant offspring through small apertures driven through the nest fabric immediately above the egg cavity. In fact the absence or otherwise of these apertures is a certain sign as to whether the nest contains eggs or young.

Some of the males, more enterprising than their fellows, attach their own nests to the bottom of those occupied by the females. These are rather wonderful structures, and the fact that they occur quite frequently rather knocks the bottom out of Jerdon's contention regarding the rejection of nests of unsuitable design. A photograph of such a nest is reproduced.



NESTS OF THE COMMON WEAVER BIRD
OR BAYA (*Ploceus baya*).



NEST OF THE STRIATED WEAVER BIRD.
(*Ploceus manyar*) in tall Elephant-grass.

The number of eggs laid is, according to Sundeval, three; Burgess six to eight, Tickell six to ten, Blyth four or five, and Jerdon two or three. But from personal observations I have found two to be the normal number, sometimes three. When more than three eggs occur in the one nest they must be the produce of more than one bird, but I have never come across an instance of this nature personally.

The eggs are pure white, somewhat cylindrical in shape and pointed at each end, and of a pinkish ground when fresh on account of partial translucency of the shells. A normal specimen would measure about 0·82 by 0·6 inch.

Ploceus manyar (723) .. The Straited Weaver-bird.
Local name .. .. Bamani Baya.
Anglo-Indian name .. Unknown.

This species, so far as my experience goes, seems to have a curious distribution in the Province, in that it appears to be missing entirely from vast tracts of country. I have seen nests in large numbers in the Kumoun Tarai as well as in certain parts of the Benares and Ghazipur districts; but have never come across the birds or their nests in any of the intervening stations, though instances of their breeding in the Etawah, Aligarh, Mainpuri, and Cawnpore districts are recorded in Hume's "Nests and Eggs of Indian Birds." They do not seem to occur at all in Bundelkhand south of the Jumna.

Though there is very little difference between the plumage coloration of this and the last species, there is certainly a marked difference between their nests. Not that the materials employed are different, nor is there much alteration in the general plan of architecture. The spacious egg-compartment and characteristic tubular entrance are present in both, but whereas in the case of the Common Baya the nest is suspended from a point and acquires the shape of a leg of mutton with an attachment at the bottom, in the case of the other, several blades of stout elephant grass (in which the nests are always built) are drawn together and incorporated in the structure to form the point of support, which has the effect of making the top of the nest dome-shaped. But the fact that one species builds in grass, and the other on trees and bushes is ordinarily quite sufficient for purposes of discrimination.

The period of nidification is the same as that of the Common Baya and the number of eggs laid is two, sometimes three; and they are also similar as regards colour, size, and shape.

Uroloncha malabarica (734) .. The White-throated Munia.
Local name .. .. .. Charchara.
Anglo-Indian name .. .. Chirookee.

This species breeds commonly throughout the Province, more commonly perhaps in the more arid tracts; especially where thorny scrub is plentiful. The birds occur, not infrequently, in gardens adjoining human dwellings where they sometimes breed; while nests are also found in creepers over the verandahs and porticos of bungalows. There does not appear to be any fixed breeding period, for this is continued throughout the year; eggs being found in practically every month.

Typically the nests are large and globular, and are composed throughout of various grasses, usually course on the oustide, lined with appreciably finer material within; and a good deal of ingenuity is evinced in putting the loose materials together. Quite frequently old bits of rag and cotton are incorporated in the structure, but are not characteristic of the nest. A small circular entrance leading to the egg-cavity is let in on one side, and the egg-cavity itself usually lined with feathers and soft materials.

The structures, though loosely put together, are quite strong and comparatively substantial; but sometimes the covering over the egg-cavity is frail, and sometimes missing altogether. They are placed at various heights from the ground, but as a rule are fairly low down, and well concealed. Thorn bushes with heavy foliage are specially favoured.

Both birds assist in building the nest and incubating the eggs, and both occupy the nest together at night. In fact, being gregarious in their habits, several birds may be observed to occupy old nests at night,not only in the winter months, but during the hot weather as well ; a curious practice peculiar to certain species of this family only.

I have never found more than six eggs in a nest, which I consider to be the full complement laid. Normally one finds only five, sometimes three or four. In shape they are typically rather broad ovals, sometimes more or less pointed towards one end. The ground colour is pure white without spot or blemish of any kind, and with no perceptable gloss. A normal specimen would measure about 0·6 by 0·5 inch.

Uroloncha acuticauda (727) ..	Hodgson's Munia.
Local name	Unknown.
Anglo-Indian name	Unknown.

It is with a certain amount of diffidence that I make mention of this species in these papers, for I am very doubtful whether it can be included among the common birds of the plains. It breeds quite commonly throughout Kumoun, but the only plains district in which I have come across their nests is Ghazipur, where they are almost invariably constructed among the spiny leaves of date and toddy palms, sometimes at considerable heights from the ground ; the most favoured months being September, October and November.

Unlike the White-throated Munia this species appears to be either wholly or partially migratory, for it seems to be absent from particular localities during the first six months of the year. My observations of their breeding habits have been confined to the one district, but from what I have been able to ascertain the work of nest construction and incubation seems to be undertaken by the female alone ; the male, during this period, being very little in evidence. Nor do the birds appear to evince the peculiar habit of the White-throated Munias of collecting together in an old nest at night.

The nests are constructed throughout of various fine grasses, and resemble very much those of the White-throated Munia, save that the small, circular entrance invariably has a canopy of fine grasses projecting over it.

The eggs are usually five in number, and are almost exact replicas of those of the other allied species. A normal specimen would measure about 0·61 by 0·42 inch.

Uroloncha punctulata (735) ..	The Spotted Munia.
Local name	Telia Munia.
Anglo-Indian name	The Spotted Munia.

This species seems to be sparingly distributed in the well-wooded and watered tracts of the province, and is wholly absent from large tracts of country; whereas in the more acrid regions it seems to occur only as a bird of passage.

The breeding season is from about July to September and the nests are almost invariably constructed in thick thorny bushes and the various acacias ; seldom at a greater height than ten feet from the ground. They are globular structures, remarkably large for the size of the bird, up to about 10 inches in diameter and 7 inches in height, and composed throughout of various grasses, straw, and strips of course grasses rather neatly interwoven. A small, circular entrance is let in on one side, and the egg-cavity carefully lined with very fine grass-stems and roots.

Not infrequently the nests are massive and shapeless, and a typical example of one of these has been admirably described by Mr. F. R. Blewitt. "A nest of this species", he says, "was remarkable as being more compact and massive than those of this species usually are. It was a very irregularly-shaped nest, something in outline like a gouty foot done up in bandages, the toe pointing downwards, and the aperture where the leg would join on; exteriorly it was composed of broad-leaved grass; interiorly of fine grass and flowering stems. The walls were fully an inch thick and very compact. The cavity, measured from the aperture to the bottom, was six inches deep, and something less than three inches in diameter; exteriorly the nest was some nine inches measured from heel to toe, and six inches from the heel to the mouth of the aperture, and some four and a half inches in breadth. The whole exterior portion was composed of green grass, but the fine lining was dry."

The number of eggs laid varies considerably, and as many as ten have been recorded from the one nest. Six or seven would seem, however, to be the normal number, though it is not unusual to find four, often five. They resemble somewhat the eggs of the White-throated Munia, but their more elongated character is very marked, by which they can be differentiated. A normal specimen would measure about 0·65 by 0·46 inch.

Sporæginthus amandava (738) .. The Indian Red Munia.
Local name .. .. .. Lal Munia.
Anglo-Indian name .. .. The Red Munia.

This entertaining little bird, like the last species, is also sparingly distributed in the more well-watered tracts of the Province, more especially in country abounding in high grass. But unfortunately it is seen more frequently in captivity than in its wild state.

The breeding season is from about June to September, and the nests are almost invariably placed in small stunted bushes in the midst of high grass, and are usually quite close to the ground; a great deal of attention being paid to concealment. I have found nests on two different occasions in bushes growing out of the sides of old wells some way down below the level of the ground. Both birds undertake the work of nest construction.

The nests and eggs are almost identical with those of the White-throated Munia; but on the whole the eggs are considerably smaller, and usually five in number. A normal specimen would measure about 0·55 by 0·43 inch.

Gymnorhis flavicollis (755) .. The Yellow-throated Sparrow.
Local name .. .. .. Jangli-churi.
Anglo-Indian name .. .. Tooti.

This is a comparatively common, though inconspicuous, bird throughout the Province; and is, as a rule, more frequently heard than seen. With the exception of a yellow patch under the throat, and dark chestnut patches on the wings, it resembles greatly the female of the House-Sparrow; and is often mistaken for one. In the winter months the birds are, to a certain extent, gregarious; but as the breeding season approaches the parties split up in couples, and are then not at all inclined to be friendly towards their neighbours; though occasionally, if the tree happens to be of gigantic proportions, it may contain more than one nest.

The breeding season is from about March to the beginning of June, and is heralded by loud, not unmusical chirrupings on the part of the male as he calls ceaselessly to the female who answers in a voice slightly modulated. The calls are reminiscent of the House-Sparrow, but are slightly more melodious and prolonged.

The nests are, without exception, placed in holes in trees. Sometimes in neat little apertures excavated by Woodpeckers or Barbets, and sometimes in mere cracks or crevices in the wood; and both birds assist in building the nest, which is almost invariably a loose collection of various grasses rather thickly lined with an assortment of feathers conforming to the internal shape of the hole or cavity.

The normal number of eggs laid appears to be three, though one finds four occasionally, very often only two. In shape they vary considerably, pyriform and more or less elliptical varieties being quite common. Typically, however, they are moderately elongated ovals, slightly pointed towards one end. The shell is dull and glossless, and of a dull greenish white ground; but this is almost obliterated by heavy smudges, streaks, and blotches of various shades of dark brown and sepia, so confluent in most specimens as to render their identification unmistakable. A normal egg would measure about 0·75 by 0·55 inch.

Passer domesticus (776) .. The Common House-Sparrow.
Local name. .. .. .. Gonriya
Anglo-Indian name .. .. The Common Sparrow.

There is not much that I can say about this species that is not only too well known already, for it seems to have come in for an abnormal amount of both abuse and appreciation which mere man, in his boundless conceit, seems to have showered on it. Even as discriminating an ornithologist as Hume did not have a good word to say for it, and, indeed, what he does say is well worth quoting.

"But what is in a name"? He asks, "Call him *domesticus* or *indicus*, it doesn't alter his depraved nature, does not make him one whit less detestable—only there is a certain *lucus a non lucendo* sarcasm involved in the Linnean name that aggravates."

"If domesticity consists in sitting upon the punkah-ropes all day, chit, chit, chit, chittering ceaselessly when a fellow wants to work, banging down in angry conflict with another angry wretch on to the table, upsetting the ink, and playing old Harry with everything, strewing one's drawing-room daily with straw, feathers, rags, and every conceivable kind of rubbish in insane attempts to build a nest where no nest can be; if I say these and fifty other atrocities constitute domesticity, heaven defend us from this greatly-lauded virtue, and let us cease to preach to our sons the merits of *domestic* wives! Conceive a wife evincing similar tendencies! Why, there isn't a jury in the country who would not return a verdict of 'sarve her right,' even if the unhappy husband should have wrung her neck before the golden honeymoon had run out. . . . . My one regret has ever been that the whole race had not before my time met, under Providence, that appropriate doom so graphically depicted in Mr. Yarrell's charming woodcut."

Mr. Benjamin Aitkin, on the other hand, is much more charitable; and not only declares his actual liking for the bird, but willingly overlooks its disorderly habits in admiration of its intelligence, courage, patience, and care for its offspring. And is quite certain that if it be but "tuneless melody" he pours forth, that it sounds far sweeter to Mrs. Sparrow than all the hurried snatches of song with which the Bulbul, Thrush, Blackbird, Robin, and Lark put off their uncomplaining mistresses.

It is not for me to criticise, nor even to draw comparisons between the considered opinions of my betters, and pioneers of ornithology; so that I am quite content to leave my readers to draw their own conclusions in accordance with their own experience of this ubiquitous bird. I will deal only with the material facts of nidification.

The breeding period seems to be continued spasmodically throughout the year, though the bulk invariably breed from about March to September. The nests are loose, untidy structures of grass and straw placed in holes, cracks, crevices, and in fact in any sort of receptacle which will hold them conveniently; the egg-cavity being thickly lined with feathers.

The eggs are up to six or eight in number, but normally only four. They vary considerably in shape, but are typically somewhat elongated ovals, only very slightly pointed towards one end. The ground-colour varies from a pale stone-colour, through shades of gray and dull yellow, to a greenish white; and the markings normally consist of specklings and streaks of different shades of dull and dingy browns and sepias scattered all over the surface of the egg. Sometimes the markings are scanty and sometimes profuse, and sometimes consist of bold spots and blotches which have a tendency to form a blotchy, ill-defined cap at the large end. A normal specimen would measure about 0·8 by 0·6 inch.

Melophus melanicterus (803) ..	The Crested Bunting.
Local name	Pathar Chirta.
Anglo-Indian name	Unknown.

This vivacious and sprightly little bird is unfortunately very sparingly distributed in the Province; and, in fact, seems to be missing entirely from large tracts of country. Its conspicuous chestnut body and black, crested head, and pleasng simple note, are unmistakeable. But the only places where I have met with the species are the wilder and less frequented portions of Bundelkhand, the Allahabad and Mirzapur districts; and even here they were not common.

In spite of the fact that I have seen and studied the birds on various occasions, I have never had the good fortune to find a nest. But I quote a description of Mr. F. R. Blewitt's who found them breeding in the Jhansi district in July and August.

"My experience", he says, "is confined to two nests: one was found at the base of a small plum-bush, near to a wall; the other in a hole in a wall. The nests are exact counterparts of each other; on the outside they are made of very course grass and roots. The egg-cavity, cup-shaped, has first an intermediate coat of fine khus, over which, again, is a complete lining of horse-hair. The outer diameter is about 4·8, inner 2·6, and depth of cavity 1·4. The nests are compact, especially the inner part of the structure, and neatly made . . Their favourite resort is old buildings and walls, to which the birds confine themselves, seldom going far away from them. The male has a peculiarly soft, melodious note, repeated at intervals. . . Three appears to be the regular number of eggs. They are of a dull whitish grey, with a sprinkling of light brown spots."

According to Hume the eggs are typically broad ovals in shape, somewhat obtuse at the small end; and a normal specimen would measure about 0·79 by 0·63 inch.

Cotile sinensis (809)	The Indian Sand-Martin.
Local name	Abali.
Anglo-Indian name	The Sand-Martin.

These fascinating little birds are commonly distributed throughout the Province in suitable localities, and as there does not appear to be any regular fixed period for nidification, they frequent particular localities throughout the year, and are seldom absent from their usual haunts.

Precipitous mud banks overlooking rivers, streams, and lakes are their favourite haunts, and where one nest occurs there are sure to be many more. For they breed, according to locality, in large or small parties; and are highly gregarious in their habits.

The nests are merely horizontal, circular tunnels about two inches in diameter, and from two to three feet in depth, which the birds excavate for themselves with their bills and claws. At the end of each tunnel is the hollow, neatly-fashioned egg-chamber lined with fine grass-stems and roots and soft feathers. Four seems to be the full complement of eggs laid, though it is not unusual to find three, often only two.

I have not been able to accumulate sufficient evidence to state definitely whether there are two broods in the year, but this is possible. I have found nests in very nearly every month, but the bulk seem to breed in March, April, and May. I have come across breeding colonies of upwards of a hundred couples with all the tunnelled nests driven into the face of a mud cliff some fifteen feet square; the little apertures being only inches apart. In such circumstances it is rather a wonderful sight to watch the building operations in progress. How each bird identifies its own nest is a problem difficult of solution.

The eggs are pure white in colour, and quite devoid of any gloss. In shape they are oval, a good deal pointed towards one end; and a normal specimen would measure about 0·68 by 0·48 inch.

Ptyonoprogne concolor (811) ..	The Dusky Crag-Martin.
Local name	Unknown.
Anglo-Indian name	Unknown.

This sober-plumaged though unmistakeable bird is sparingly distributed throughout the Western districts of the Province, especially in the wilder and more desolate tracts. Its name, in fact, would suggest as much. I have never met with this species east of Chunar on the Ganges, and I very much doubt whether it occurs at all in the Province east of Benares.

In localities where it is a constant resident, it is never met with in any numbers. Indeed Chunar, with its wild and rocky environment and ancient buildings, could boast only of the one pair; which, after various attempts to build a nest, finally decided on a site quite inaccessible for either man or beast, and eventually got the nest fixed on to a perpendicular wall quite sixty feet from the ground; and there it remained in perfect security.

The breeding season is from about February to July, though the nest mentioned above did not contain eggs till the middle of August. If one were to take a small, deep saucer and cut it exactly in halves, and then stick the cut face on to some perpendicular wall, one would get a fair idea of what the nest of this species is like; save that the nest is made up of small mud pellets stuck closely together, and inclining to a well-defined point beneath. The egg-cavity is more or less cup-shaped, and lined internally with fine grass-stems, roots, and soft feathers. The perpendicular stone walls of old buildings, the shelving sides of large rocks, and cliff-faces are specially favoured; particularly those in the wilder and less frequented spots; and yet quite recently I found one quixotic pair endeavouring to build a nest in the verandah of a large business establishment in Hazratgunj; perhaps the busiest thoroughfare of Lucknow.

The full complement of eggs laid appears to be four, though it is more usual to find only three. In shape they are typically moderately elongated ovals, distinctly pointed at one end. The ground-colour is white, while the markings consist of specks and spots, occasionally blotches, of various shades of yellowish and reddish brown more or less thickly scattered over the whole egg, but particularly towards the large end, where they have a tendency to form an irregular zone. A normal specimen would measure about 0·7 by 0·5 inch.

Hirundo smithii (818)	The Wire-tailed Swallow.
Local name	Leishra.
Anglo-Indian name	The House-Martin.

This beautiful little bird, so easily distinguished from the last species by its beautiful plumage of metallic lustre, and by the two long wire-like feathers in the tail, is also sparingly distributed throughout the Western districts of the Province; and, like the last species, does not seem to occur at all east of Benares.

Like the Dusky Crag-Martin, it frequents mosques and old buildings, but is found more frequently in the vicinity of running water for which it has a peculiar weakness. They are vivacious and sprightly birds which capture their food on the wing, but are not nearly as friendly as the Dusky Crag-Martin. However, they are most fascinating birds to watch on a bright morning when the sun's rays may be observed to scintillate on their brilliant metallic plumage in the most wonderful manner.

The period of nidification seems to be somewhat prolonged, from about February to September; though the bulk seem to breed in April and May. The nests are found almost exclusively in the immediate neighbourhood of water running streams particularly; the most favoured sites being under the cornices of bridges, under stone culverts spanning canals, under overhanging shelves of rock, or the faces of mud or stone cliffs overlooking rivers and streams, and occasionally in old buildings in the vicinity of water.

The nests are composed externally of mud, about 5½ inches broad, and 3 inches across, and resemble greatly those of the Dusky Crag-Martin. The egg-cavity, which is usually a neat hemispherical hollow, is lined with fine grass-roots and a various assortment of soft feathers; and both birds assist in the construction. I have never found more than one nest in the one vicinity.

Three seems to be the normal number of eggs laid. In shape they are typically narrow ovals, a good deal pointed towards one end. The shells are fine and delicate with a bright gloss when fresh. The ground-colour is a delicate pinkish white usually thickly speckled, spotted, and blotched with various shades of reddish brown. In some eggs the markings are pretty evenly distributed over the whole surface, and in others they are more numerous towards the large end, where they have a tendency to form rather a distinct zone. As a whole the eggs are very beautiful, and a normal specimen would measure about 0·7 by 0·5 inch.

Hirundo fluvicola (819)	The Indian Cliff-Swallow.
Local name	Unknown.
Anglo-Indian name	Unknown.

This species, so far as nidification is concerned, is quite the most gregarious of all the allied species, and occurs in certain localities of the Province; but not, so far as I am aware, east of Benares. They are most interesting and energetic birds, but do not appear to have a wide distribution. In the localities where they do occur, and breed, they are met with in large numbers; and their nests, crowded close together, look from a distance like some gigantic honeycomb.

I have come across breeding colonies of this species only three times. One was a collection of about fifty nests on the face of a high mud cliff overlooking the Belan river at the south-eastern corner of the Allahabad district; a second of about a hundred nests under a high railway bridge over a stream about twenty miles east of Mirzapur, and a third of about two hundred nests under the railway bridge over the Ken river at Banda;—in each case in wild and rugged country, so that the birds would seem to favour the less frequented spots. In each of the above cases the nests were very inaccessible, and I have always regretted my inability to secure decent photographs.

A most admirable account of the nesting habits of this species has been furnished by Mr. James Aitkin who writes:—"The smallest of our Swallows, and much less familiarly known than the other species, as it lives in colonies, and is strictly confined to certain localities; at Akola there is one of these colonies, which build their nests under the broken portion of a wall which stretches out into the Moorna. The nests are retort-shaped; a few stand apart, but the majority are attached together, the tubular necks all standing out from the wall, and presenting a very peculiar appearance. With the first heavy showers of the monsoon the river comes down in a flood and washes the whole place clean. As soon as the rains abate, rebuilding commences, and the bustle in the early morning is prodigious, the birds hurrying from all quarters with their bills full of mud. They are much persecuted by Sparrows, who take possession of the egg-cup of the nest before the neck is added, and a single pair will cause several nests to be deserted before they suit themselves. . . . The second brood is in February, during which months they swarm about the nests like bees about a hive, while every now and then splash into the water goes some too fragile neck, breaking even under the light weight of the little owner. These breakages do not, however, interfere in the least with the process of incubation, but appear to be repaired even while the mother bird is sitting."

Nests may be found in practically any month from February to August, but whether two broods are hatched each year is still a matter of uncertainty. The nests are made of small mud pellets stuck close together. They are small and retort-shaped with the chamber about four inches in diameter, and the tubular mouth invariably turned outwards, varying from two to five inches in length, and crammed as close together as possible. Internally they are well lined with grass-roots and soft feathers and rendered extremely cosy; but how each bird recognises its own nest is perfectly marvellous.

The normal number of eggs laid appears to be three. Typically they are a long oval, a good deal pointed towards one end, though pyriform and almost cylindrical varieties are frequently met with. The ground-colour is pure white, pinkish when fresh on account of partial translucency of the shells, which are fine and delicate. Some eggs are pure white throughout without a spot or blemish of any kind; while others are spotted, speckled, mottled and clouded with dull shades of reddish brown never very sharply defined; and as a rule, they are more numerous towards the large end. A normal egg would measure about 0·7 by 0·5 inch.

Hirundo erythropygia (823) ..	Sykes's Striated Swallow.
Local name	Masjid-ababil.
Anglo-Indian name	The Red-backed Swallow.

This handsome swallow, so easily recognised by the conspicuous red patch on the rump, has perhaps the widest distribution of all the allied species; as it seems to occur in the Eastern and Western districts alike. It is never met with in large numbers, but either singly or in pairs flitting about in the vicinity of old ruins, mosques, and temples, where it exhibits very little fear of man.

The breeding season is from about March to July, according to locality; and the nest, always solitary, is so typical as to be quite unmistakeable. It is a large retort-shaped structure in which the tubular entrance might be anything up to ten inches in length, composed of small mud pellets stuck firmly on to the under surface of some horizontal wall; well lined internally with fine grass-roots and stems and a various assortment of soft feathers.

The most favoured places are the roofs of old and ruined buildings, but the nests are by no means confined to these ancient relics, and may be frequently found in all sorts of weird places. As Mr. F. R. Blewitt very rightly remarks: "Eccentric to a degree is this swallow in the selection of a suitable place for its nest," for I have personally found the nests in barns and stables, old buildings, mosques and temples, under rocks and ledges in old caves, under the corrugated sheeting of an old latrine, and under an old wooden bridge where the water was all but touching the bottom of the nest; and, last but not least, under a small ledge quite fifty feet down an old and disused well. Both birds share in the labours of nest construction.

The eggs are up to four in number, and pure white in colour without any perceptible gloss. In shape they are rather long ovals, somewhat blunt at both ends; though pyriform varieties are not uncommon. A normal specimen would measure about 0·78 by 0·55 inch.

(*To be continued*).

A REVIEW OF THE ASIATIC SPECIES OF *CONTIA* IN INDIAN MUSEUMS.

BY

COL. F. WALL, I.M.S., C.M.G., C.M.Z.S.

The identification of many of the Asiatic species of *Contia* has for many years caused me—as it must have done others—considerable perplexity. This is not surprising when one studies the key to these species and the descriptions in Boulenger's Catalogue (Vol. II, pp. 255 *et seq.*). Some of the supposed species are so closely affined that they can only be separated by very minute differences in the relative length and breadth of such shields as the rostral and frontal. When his Catalogue appeared in 1894 Boulenger had seen one specimen of *angusticeps* submitted to him by Mr. Sclater from the Indian Museum, which he made the type of a new species under that name. The British Museum Collection contained no specimen of *fasciata*, only one specimen of *persica*, and two of *walteri*. I have for many years had doubts as to the validity of some of these species, and in answer to my appeals I have been able to examine and compare recently all the available specimens of *Contia* in the Indian and Quetta Museums, and the Bombay Natural History collection, thanks to Dr. Annandale, Mr. Bond, and Mr. Spence. In addition to these specimens I have examined many & others. I propose to put these records together in this paper, and it will be seen that there are good grounds for considering *angusticeps* the same as *persica*, *condoni* the same as *decemlineata*, and that one specimen in the Bombay collection deserves recognition as a species new to science for which I propose the name *zebrina*.

I have examined minutely the specimens referred to above, and append below descriptions and synopses showing the details of the lepidosis.

CONTIA PERSICA (Anderson).

Cyclophis persicus.—Anderson, P.Z.S., 1872, p. 392. Blanford, Zool. E. Persia, 1876, p. 408.

Pseudocyclophis persicus.—Boettger, Zool. Jahrb., 1888. III, p. 922.

Contia persica.—Boulenger, Cat. Vol. II, 1894, p. 263. Ingoldby, Bomb. N. H. Jourl., Vol. XXIX, p. 129. Wall, Bomb. N. H. Jourl., Vol. XVIII, p. 801.

Contia angusticeps.—Annandale, Vol. XVIII, p. 801. J.A.S. Bengal, 1904, p. 208. Boulenger, Cat. Vol. II, 1894, p. 262. Ingoldby, Bomb. N. H. Jourl., Vol. XXIX, p. 129. McMahon, Bomb. N. H. Jourl.. Vol. XIV, p. 181. Wall, Bomb. N. H. Jourl. Vol. XVIII, p. 501.

Contia walteri.—Wall, Bomb. N. H. Jourl., Vol. XX, p. 1037.

Length.—345 mm. ($13\frac{5}{8}$ inches), tail 78 mm. ($3\frac{1}{8}$ inches).

Lepidosis.—(*a*) *Typical. Rostral.* Depth from three-fifths to two-thirds its breadth. Portion visible above from two-thirds to a shade less than the suture between the internasals. *Internasals.* The suture between the fellows subequal to that between the praefrontal fellows. *Praefrontals.* The suture between the fellows from one quarter to two-fifths the length of the frontal. *Supraoculars.* Length from two-thirds to four-fifths the length of the frontal, half the parietals; breadth from half to two-thirds that of the frontal. *Frontal.* Length equal to or rather greater than its distance to the end of the snout, three-fifths to two-thirds that of the parietals. *Loreal.* Absent, the praefrontal touching the 2nd labial. *Praeocular.* One. *Postocular.* One. *Temporals.* 1+1. *Supralabials.* 7; the 1st and 2nd touching the nasals, 3rd and 4th the eye, and the 5th and 6th the anterior temporal. *Sublinguals.* Posterior shorter than the anterior; in contact with the 4th and 5th, or only the 5th infralabials. *Infralabials.* 5, the 5th touching two scales behind. *Costals.*

Two heads-lengths behind the head 15, midbody 15, two heads-lengths before the vent 15 or 13. When the rows reduce from 15 to 13 the 3rd and 4th rows above the ventrals blend. Smooth. With single apical pits. *Ventrals* 185 to 214. From 6 to 8 pairs of scales intervene between the 1st ventral and the posterior sublinguals. *Anal.* Divided. *Subcaudals.* 63 to 82. Divided.

(*b*) *Anomalies. Loreal.* A very small shield rarely present. *Posterior sublinguals.* Rarely separated by one scale. *Costals.* Rarely the 4th row above the ventrals divides, the resultant rows blend, and the redivision and blending may be repeated making the rows 17 in places.

Colouration.—Dorsally the scales are a pale brown or dun with buff margins. This is most marked in the anterior part of the body, the colour becoming uniform buff posteriorly. In some specimens there are a few black spots behind the neck arranged quincuncially, or confluent to form cross bars. Belly unspotted. Head with three black cross-bars which may be completely confluent. The anterior passes between the eyes, and reappears below the eye on the upper parts of the 3rd or 3rd and 4th supralabials. The median passes over the middle of the parietals and extends to the upper parts of the 5th, 6th and 7th supralabials. The posterior lies just behind the parietals, and involves 4 or 5 rows of scales behind, extending to the sides of the neck. In spirit the black often fades considerably.

Sexes.—The male genitalia are cylindrical organs, not bifid, and are beset with numerous very small recurved spines.

Distribution.—Persia. Baluchistan. Waziristan. N.W. Frontier (Malakand. Parachinar). W. Himalayas (Murree).*

NOTE.—I think it probable that the specimen labelled *walteri* in the British Museum from Kohistan, Sind, will prove to be this species.

CONTIA FASCIATA (Jan.).

Length.—358 mm. (14⅛ inches), tail 54 mm. (2⅛ inches).

Lepidosis.—(*a*) *Typical. Rostral.* Depth about two-thirds its breadth. Portion visible above twice or nearly twice the length of the suture between the internasal fellows. *Internasals.* The suture between the fellows half to three-fourths that between the praefrontal fellows. *Praefrontals.* The suture between the fellows one-third to two-fifths the length of the frontal. *Supraoculars.* Length equal to or a shade less than the length of the frontal, three-fifths to four-fifths the parietals. Breadth equal to that of the frontal. *Frontal.* Length greater than its distance to the end of the snout, two-thirds to four-fifths the parietals. *Nasal.* Entire. *Loreal.* One, one-third to two-fifths the length of the nasal. *Praeocular.* One. *Postoculars.* Two. *Temporals.* 1+1. *Supralabials.* 7; the 1st and 2nd touching the nasals, the 3rd and 4th the eye, 5th and 6th the anterior temporal. *Sublinguals.* The posterior about three-fourths the length of the anterior, separated by one scale; in contact with the 4th and 5th infralabials. *Infralabials.* 5, the 5th in contact with three scales behind. *Costals.* Two heads-lengths behind the head 15, midbody 15, two heads-lengths before the vent 13. The rows reduce from 15 to 13 four to six heads-lengths before the vent by the fusion of the 3rd and 4th rows above the ventrals. Smooth. With single apical pits which are extremely difficult to detect in spirit specimens. *Ventrals.* 126 to 157 (158 to 171 Boulenger). From 4 to 6 pairs of scales between the 1st ventral and the posterior sublinguals. *Anal.* Divided. *Subcaudals.* 39 to 49; divided (48 to 62 Boulenger).

(*b*) *Anomalies. Supralabials.* The 5th is divided in one specimen on one side forming a spurious lower anterior temporal. The 3rd and 4th are confluent on one side in one specimen and the 6th and 7th confluent on both sides on the same specimen, and the 6th and 7th confluent on one side in another *Posterior sublinguals.* In contact in one specimen. *Subcaudals.* In one specimen the 3rd to the 7th are subdivided making four shields across the tail. In another the 2nd is entire.

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* This specimen used to be in the Bombay collection but is now missing.

Dentition.—I have no skull but I have a note saying that "the *maxillary* teeth are dubiously 11, the *palatopterygoid* series dubiously 22, and the *mandibular* dubiously 11."

Colouration.—Dorsally buff to pale brown with from 33 to 40 blackish bars on the body, and 11 to 16 on the tail. These extend to the edge of the ventrals. A series of dark spots on the edge of the ventrals and last row of costals alternate with the bars. Belly unspotted, or with a scanty dusky mottling or suffusion mesially from the throat extending slightly backwards. Head in well marked examples with a dusky suffusion on the top involving the frontal, the inner two-thirds of the supraocular and inner two-thirds of the parietal shields, extending below the eye to the upper parts of the 3rd and 4th supralabials. A nuchal bar involves four to five rows of scales in the length of the snake and extends round the sides of the neck but is not complete across the throat.

Breeding.—A female 358 mm. (14⅛ inches) in length contained five eggs in the oviducts, of such a size and character as to suggest that this species is oviparous.

Distribution.—*Palestine.* (Shellal, Wadiguzzi and Deir-el-Belah). *Iraq.* (Shaiba, Faluja). *S. Persia.* (Maidan Mihaftan).

CONTIA MCMAHONI Wall.

C. mcmahoni.—Wall, Bomb. N. H. Jourl., Vol. XX, p. 1038.

Length.—311 mm. (1 foot and ¼ of an inch), tail 84 mm. (3⅜ inches).

Lepidosis. Rostral. Depth two-thirds to three-fourths its breadth. Portion visible above two-thirds the suture between the internasal fellows. *Internasals.* The suture between the fellows equal to or a shade greater than that between the praefrontal fellows. *Praefrontals.* The suture between the fellows one-third to one-fourth the length of the frontal. *Supraoculars.* Length three-fourths to four-fifths the length of the frontal, half to three-fifths the parietals. Breadth about half that of the frontal. *Frontal.* Length rather greater than its distance to the end of the snout, three-fifths to three-fourths the parietals. *Nasal.* Entire. *Loreal.* None. *Praeocular.* One. *Postocular.* One. *Temporals* 1+1. *Supralabials.* 7, 1st and 2nd touching the nasal, 3rd and 4th the eye, 5th and 6th the anterior temporal. *Sublinguals.* The posterior about three-fourths the anterior; in contact or separated by one scale; touching the 4th and 5th infralabials. *Infralabials.* 5, the 5th touching two scales behind. *Costals.* Two heads-lengths behind the head 13, midbody 15, two heads-lengths before the vent 13. The increase from 13 to 15 occurs about four heads-lengths behind the head, and is due to the 3rd or 4th row above the ventrals dividing. The decrease from 15 to 13 occurs about eight heads-lengths before the vent, where the 3rd and 4th rows above the ventrals blend. Smooth. With single apical pits. *Ventrals.* 204 to 212. From 6 to 8 pairs intervene between the first ventral, and the posterior sublinguals. *Anal.* Divided *Subcaudals.* 91 to 96; divided.

Colouration.—Dorsally the scales are pale brown centrally with buff margins. The brown is darker in the anterior part of the body than posteriorly. A few obscure blackish spots on the neck in some specimens. Belly unspotted. Head blackish or dusky, the black extending for about four rows in the length of the snake behind the parietals, and laterally to the temporals and upper parts of the 5th, 6th and 7th, or 6th and 7th supralabials.

Distribution.—Baluchistan (Loralai, Spitangi. Mach. Quetta).

CONTIA COLLARIS (Menetries).

Length.—340 mm. (13⅜ inches), tail 62 mm. (2½ inches).

Lepidosis.—(*a*) *Typical. Rostral.* Depth two-thirds to three-fourths its breadth. Portion visible above equal to or less than the suture between the internasal fellows. *Internasals.* Suture between the fellows equal to or a little shorter than that between the praefrontal fellows. *Praefrontals.* The suture between the fellows one-third to two-fifths the length of the frontal. *Supraoculars.* Length a little shorter than the frontal, three-fifths the parietals. Breadth half to three-fourths that of the frontal. *Frontal.* Length rather greater than its distance to the end of the snout; two-thirds to three-fourths the parietals. *Nasal.* Entire. *Loreal.* Small, about one-third the length of the nasal (sometimes absent). *Praeocular.* One *Postocular.* One, *Temporals.* 1+1 or 1+2. *Supralabials.* 7; the 1st and 2nd touching the nasals, 3rd and 4th the eye, and the 5th and 6th the anterior temporals. *Sublinguals.* The posterior rather shorter than the anterior, in contact with one another, touching the 4th and 5th infralabials. *Infralabials.* 5, the 5th touching two scales behind. *Costals.* Two heads-lengths behind the head 15, midbody 15, two heads-lengths before the vent 15 or 13. Smooth. With single apical pits. *Ventrals.* 157 to 189 (150 to 191 Boulenger). 4 to 6 pairs of scales between the 1st ventral and the posterior sublinguals. *Anal.* Divided. *Subcaudals.* 54 to 62, divided. (50 to 78 Boulenger).

(*b*) *Anomalies. Subcaudals.* The 2nd to 6th are entire in one specimen.

Dentition.—Maxillary 17; anonodont, isodont. *Palatine.* 9 to 10; anododont, isodont. *Pterygoid.* 19 to 20, anododont, isodont. *Mandibular.* 16; anododont, isodont.

Vertebrae. Neural spines about one-fourth the depth of the body: Hypapophyses well developed in anterior vertebrae ceasing in the second eighth of the body of the snake. Bifid in the first caudal and succeeding vertebrae.

Costae. The first articulated to the 3rd vertebra. Well developed, as long as the second. Last bifid, the outer ramus very short. First two caudal vertebrae with bifid pseudo-costal processes.

Colouration.—Dorsally uniform buff or pale brown. Belly unspotted. Head black above, involving the posterior part of the internasals or praefrontals and the anterior two-thirds to three-fourths of the parietals. Laterally the black extends to the edge of the parietals and involves the upper part of the 3rd and 4th supralabials. In the Muscat specimen the whole of the 2nd, 3rd and 4th supralabials are black and the outer part of the sublinguals and 1st infralabials, and all of the 2nd to 5th infralabials. A black nuchal bar involving four to five rows in the length of the snake, begins just behind the parietals and extends laterally to below the throat where it is incomplete mesially.

Distribution.—Grecian Archipelago. Cyprus. Asia Minor to Caucasus. Arabia (Muscat). Iraq Baghdad. Persia.

CONTIA ZEBRINA spec. nov.

Length.—475 mm; (18¾ inches) tail 125 mm. (5 inches).

Lepidosis.—*Rostral.* Depth two-thirds its breadth, portion visible above about two-thirds the suture between the internasal fellows. *Internasals.* The suture between the fellows equal to that between the praefrontal fellows. *Praefrontals.* The sutures between the fellows half the length of the frontal. *Supraoculars.* Length three-fourths the frontal, half the parietals; breadth three-fifths that of the frontal. *Frontal.* Length a shade longer than its distance to the end of the snout, two-thirds the parietals. *Nasal.* Entire. *Loreal.* None. *Praeocular.* One. *Postocular.* One. *Temporals.* 1+2. *Supralabials.* 7, the 1st and 2nd touching the nasal, 3rd and 4th the eye, 5th and 6th the anterior temporal. *Sublinguals.* The posterior about three-fourths the length of the anterior; in contact with one another; touching the 4th and 5th infralabials. *Infralabials.* Five, the 5th touching two scales behind. *Costals.* Two heads-lengths behind the head 15, midbody 15, two heads-lengths before the vent 13. The rows reduce from 15 to 13 about five heads-lengths before the vent by the blending of the 4th and 5th rows above the ventrals. Smooth. With single apical pits. *Ventrals.* 225. 7 pairs of scales between the 1st ventral and the posterior sublinguals. *Anal.* Divided. *Subcaudals.* 110; divided.

Colouration.—Dorsally tawny with many close-set, blackish, linear cross bars, about sixty-eight in the anterior half of the body. The first bar is on the 5th row behind the parietals. The bars extend to the edges of the ventrals and gradually fade till the posterior part of the body is uniform buff. On close examination the bases and centres of the scales are a pale dun, and the edges buff The belly is unspotted. The head is uniform except for a blackish mark on the upper halves of the 3rd and 4th supralabials. There is no nuchal bar.

Distribution.—Bazdad, South Persia. The type is in the Bombay collection (No. 171-1).

CONTIA CORONELLA (Schlegel).

Length.—106 mm. (4½ inches).

Lepidosis. Rostral. Depth about two-thirds its breadth. Portion visible above rather greater than the suture between the internasal fellows. *Internasals.* The suture between the fellows rather less than that between the praefrontal fellows. *Praefrontals.* The suture between the fellows one-fourth the length of the frontal. *Supraoculars.* Length three-fourths that of the frontal three-fifths the parietals; breadth one half that of the frontal. *Frontal.* Length about twice its distance to the end of the snout, a shade greater than the parietals. *Nasal.* Entire. *Loreal.* One; small, about two-fifths the length of the nasal. *Praeocular.* One. *Postoculars.* Two. *Temporals.* 1+2. *Supralabials.* Seven, the 1st and 2nd touching the nasal, 3rd and 4th the eye, and 5th and 6th the anterior temporal. *Sublinguals.* Posterior subequal to the anterior; separated by 2+1 scales; touching the 4th and 5th infralabials. *Infralabials.* 5; the 5th touching 3 scales behind. *Costals.* Two heads-lengths behind the head 17, midbody 17, two heads-lengths before the vent 15. The rows reduce from 17 to 15 about six heads-lengths before the vent by the blending of the 3rd and 4th rows above the ventrals. Smooth. With single apical pits. *Ventrals.* 142. (103 to 148 Boulenger) Divided. *Subcaudals.* 33, divided (24 to 52 Boulenger) 2 pairs of scales between the 1st ventral and the posterior sublinguals. *Anal.* Divided.

Colouration. Dorsally pale dun with ten series of deep brown spots arranged quincuncially. Belly with four series of round, brown spots arranged two on each ventral, the outer of one side and the inner of the opposite. Head with a brown bar between the eyes, reappearing below the eye and involving the posterior part of the second, the whole of the 3rd and the anterior part of the 4th supralabials. A dark speck on the 3rd infralabials. A black nuchal bar involving 5 scales in the length of the snake, separated except mesially from the parietals by two rows of scales. This is complete right round the throat.

Distribution.—Shellal, Wadi Guzzi, Palestine. (No. 19428 in the Indian Museum.)

CONTIA DECEMLINEATA (Dumeril and Bibron).

C. decemlineata.—Boulenger, Cat., Vol. II, p. 260.
Contia condoni.—Boulenger, Bomb. N. H. J., Vol. XXVI, p.. 1024.
Length. 498 mm. (19¾ inches), tail 128 mm. (5⅛ inches).

Lepidosis. (*a*) *Typical Rostral.* Depth about three-fourths its breadth. *Internasals.* The suture between the fellows from half, to equal to that between the praefrontal fellows. *Praefrontals.* The suture between the fellows two-fifths to three-fifths the length of the frontal. *Supraoculars.* Length equal to or a little shorter than the frontal, three-fifths to two-thirds the parietals; breadth three-fourths to four-fifths that of the frontal. *Frontal.* Length equal to or a shade greater than its distance to the end of the snout, two-thirds to four-fifths the parietals. *Nasal.* Entire. *Loreal.* One. *Postoculars.* Two. Temporals. 1+2. *Supralabials.* 7; the 1st and 2nd touching the nasal, 3rd and 4th the eye, 5th and 6th the anterior temporal. *Sublinguals.* Posterior a little shorter than the anterior, in contact with one another, touching the 4th and 5th infralabials. *Infralabials.* Five, the 5th touching two scales behind. *Costals.* Two heads-lengths behind the head 17, midbody 17, two heads-lengths before the vent 15. The reduction from 17 to 15 is caused by the 3rd and 4th rows above the ventrals blending six to eight heads-lengths before the vent. Smooth. With single apical pits. *Ventrals.* 150 to 174. (152 to 175 Boulenger). 3 to 6 pairs of scales between the first ventral and the posterior sublinguals—*Anal.* Divided. *Subcaudals.* 69 to 92; divided (64 to 85 Boulenger).

(*b*) *Anomalies. Postoculars.* In specimen No. 6 the upper postocular is confluent with the supraocular on both sides. *Supralabials.* The 3rd is divided in one specimen on one side, making the series total 8, the 4th and 5th touching the eye. *Posterior sublinguals.* Sometimes separated by a scale. *Infralabials.* The 5th is sometimes in contact with 3 scales behind.

Colouration.—Dorsally buff with oblong blackish spots arranged quincuncially. A series of single spots on the edge of the ventrals, a series of dual spots on the edges of the 2nd and 3rd, and 3rd and 4th rows and a series of triple spots on the edges of the 5th and 6th, 6th and 7th, and 7th and 8th rows (sometimes also the 8th and 9th). These tend to become dotted longitudinal lines posteriorly. Belly unspotted. Head with no black bars. No nuchal bar. Upper supralabials with dusky sutures especially evident between the 3rd and 4th, and 5th and 6th shields (sometimes in all).

Breeding.—A specimen 482 mm. (19 inches) in length contained three eggs in the oviducts, of such a size and character as to suggest that the species is oivparous..

Distribution.—Persia.

Serial Number.	Sex.	Length in mm.	Tail in mm.	Costals.			Ventrals.	Subcaudals.	Rostral.		Length of suture between internasals to suture between praefrontals.	Length of suture between praefrontals to length of frontal.	Supraocular.			Frontal.	
				Two head-lengths behind head.	Midbody.	Two head-lengths before vent			Depth to breadth.	Portion visible above to suture between internasals.			Length to frontal.	Length to parietals.	Breadth to frontal.	Length to snout.	Length to parietals.
																	CONTIA
1	♀	339	65	15	15	15	213	63	2/3	2/3	>	1/3	4/5	½	½	=	3/5
2	♂	339	75	15	15	13	200	79	2/3	2/3	=	2/5	¾	½	¾	>	¾
3	♀	311	56	15	15	13	204	67	2/3	½	>	<1/3	2/3	½	3/5	>	2/3
4	♂	330	68	15	15	13	198	74	2/3	½	>	..	¾	½	3/5	=	3/5
5	♂	265	tip broken	15	15	15	202	..	2/3	½	>	..	¾	½	>½		2/3
6	♂	293	62	15	15	13	207	74	3/5	½	>	..	⅔	½	3/5	>	2/3
7	♀	336	60	15	15	13	199	66	3/5	½	=	..	¾	½	3/5	>	2/3
8	♀	345	78	15	15	13	214	77	2/3	2/3	>	¼	<	½	½	=	3/5
9	..	140	..	Bad state					3/5	<½	>	<1/3	4/5	<½	½	>	3/5
10	♂	323	68	15	15	15	205	82	..	..	=	..	¾	½	2/3	..	..
11	♀ ?	311	65	15	15	15	201	77	2/3	<½	=	1/3	¾	½	½	>	3/5
12	♂	290	72	15	15	13	185	82	2/3	½	>	1/3	¾	½	½	>	2/3
13	♀ ?	312	62	15	15 17	15	205?	74	2/3	½	=	1/3	<	>½	3/5	>	2/3
14	♂	244	53	15	15	15	200	79	2/3	¾	=	1/3	2/3	½	3/5	>	2/3
15	♂	222	53	15	15	13	192	80	¾	<	=	<1/3	¾	½	½	>	2/3
16	♂ ?	312	72	15	15 17	15	200	76	¾	=	=	¼	¾	½	3/5	>	2/3
7	♂	272	66	15	15	13	186	78	¾	<	=	<1/3	¾	½	2/3	>	2/3
										Specimens 12 to 17 are labelled *angusticeps* Sir A. H. McMahon. I have examined							
																	CONTIA
1	♂	250	50	15	15	13	131	48	2/3	>	>½	½	=	2/3	>	<	2/3
2	♀	305	50	15	15	13	153	42	2/3	2/3	<½	<½	<	2/3	=	>	3/4
3	♂ ?	128	..	15	15	13	126	49	2/3	2/1	½	<½	<	2/3	=	>	3/4
4	♂ ?	221	43	15	15	13	137	43	2/3	2/1	½	2/5	<	¾	=	>	<
5	♀	358	54	15	15	13	152	37	2/3	2/1	>½	<½	4/5	2/3	=	>	<
6	♂	250	50	15	15	13	136	45	2/3	>	2/3	1/3	<	4/5	=	>	<
7	♀	232	35	15	15	13	150	35	2/3	<2/1	½	2/5	<	4/5	=	>	<
8	♀	244	40	15	15	13	157	39	2/3	2/1	½	2/5	<	2/3		>	4/5
9	♂	288	60	15	15	13	134	45	2/3	2/1	½	2/5	=	4/5	=	>	4/5
10	♂	258	56	15	15	13	146	51	2/3	<2/1	¾	1/3	<	3/5	=	>	<
11	♀	245	35	15	15	13	157	39	2/3	2/1	½	2/5	<	2/3	=	>	4/5
																	CONTIA
1	♂ ?	312	85	13	15	13	209	94	2/3	⅔	=	¼	<	3/5	½	>	¾
2	..	..	..	13	15	13	212	96?	¾	⅔	<	⅓	¾	<½	<½	>	3/5

Loreal.	Praeocular.	Postocular.	Temporals.	Supralabials.		Posterior sublinguals.			No. of scales behind last infralabial.	Locality.	Where preserved.
				Number.	Touching eye.	Length to anterior sublinguals.	Infralabials in contact.	Separated or in contact.			
PERSICA (Anderson).											
0	1	1	1+1	7	3rd & 4th	2/3	4th & 5th	cont	2	Maidan Mihaftan, S. Persia.	No. 460 Bombay N.H. Soc. Collection.
0	1	1	1+1	7	do.	¾	4th	do.	2	do.	No. 459 do.
0	1	1	1+1	7	do.	¾	4th & 5th	do.	2	do. ..	No. ? do.
0	1	1	1+1	7	do.	<	do.	do.	2	S. Persia	St. Joseph's College, Bangalore.
0	1	1	1+1	7	do.	<	do.	do.	2	do.	do.
0	1	1	1+1	7	do.	¾	do.	do.	2	do.	do.
0	1	1	1+1	7	do.	<	do.	do	2	do.	do.
0	1	1	1+1	7	do.	<	do.	cont	2	Sharigh, Baluchistan.	No. 132, Quetta Museum.
0	1	1	1+1	7	do..	2/3	do.	do.	2	Quetta, Baluchistan.	No. 177 do.
1	1	1	1+1	7	do.	<	5th	..	..	Kirgi, Waziristan ..	My collection.
0	1	1	1+1	7	do.	¾	do.	cont	2 L 3 R	Kotkai, Waziristan ..	do.
0	1	1	1+1	7	do.	¾	4th & 5th	do.	2	Malakand	No. 802, Bombay Collection.
0	1	1	1+1	7	do.	=	do.	do.	2	do.	No. 803 do.
0	1	1	1+2	7	do.	<	do.	do.	2	do.	No. 171 D. 1 do.
0	1	1	1+1	7	do.	<	do.	sept.	2	do.	No. 14437 Indian Museum.
0	1	1	1+1	7	do.	<	do.	cont	2	do.	No. 14438 do.
0	1	1	1+1	7	do.	<	do.	do.	2	do.	No. 14440 do.
and were all collected by several others from this locality.											
FASCIATA (Jan.).											
1	1	2	1+2	7	3rd & 4th.	4/5	4th & 5th	sept.	2	Shellal, Wadi-Gazzi, Palestine.	19429 Indian Museum.
1	1	2	2+2	7	do.	4/5	do.	sept	2	do. ..	19430 do.
1	1	2	1+1	7	do.	4/5	do.	sept.	2	Deir-el-Belah, Palestine	19431 do.
1	1	2	1+1	7	do.	2/3	do.	sept.	3	Maidan Mihaftan, S. Persia.	462 Bombay collection.
1	1	2	1+1	7	do.	¾	do.	sept.	3	do. ..	461 do.
1	1	2	1+1	7	do.	2/3	do.	sept.	3	do. ..	463 do.
1	1	2	1+1	7	do.	¾	do.	sept.	3	do. ..	171 C1 do.
1	1	2	1+1	7	do.	=	do.	sept.	3	do. ..	171 C3 do.
1	1	2	1+1	7	do.	¾	do.	sept.	3	do. ..	171 E3 do.
1	1	2	1+1	7	do.	¾	do.	sept.	3	Shaiba, Iraq	171-4 do.
1	1	2	1+1	7	do.	=	do.	sept.	3	Faluja, Iraq	171-C3 do.
MCMAHONI Wall.											
0	1	1	1+1	7	3rd & 4th	¾	4th & 5th	sept	2	Loralai, Baluchistan..	53 Quetta Museum.
0	1	1	1+1	7	do.	4/5	do.	cont	2	Spitangi, Baluchistan.	26 do.

Serial Number.	Sex.	Length in mm.	Tail in mm.	Costals.			Ventrals.	Subcaudals.	Rostral.		Length of suture between internasals to suture between praefrontals.	Length of suture between praefrontals to length of frontal.	Supraocular.			Frontal.	
				Two heads lengths behind head.	Midbody.	Two heads lengths before vent.			Depth to breadth.	Portion visible above to suture between internasals.			Length to frontal.	Length to parietals.	Breadth to frontal.	Length to snout.	Length to parietals.
CONTIA																	
1	..	260	54	15	15	15	189	62	2/3	½	=	<1/3	<	3/5	½	>	3/4
2	..	237	40	15	15	13	178	54	¾	2/3	<	2/5	4/5	3/5	2/3	>	¾
3	..	154	..	15	15	15?	162?	62	¾	=	<	2/5	<	3/5	3/4	>	¾
4	..	165	..	15	15	15	179	62	¾	=	<	2/5	<	3/5	¾	>	2/3
CONTIA																	
1	..	475	125	15	15	13	225	110	2/3	2/3?	=	½	¾	½	3/5	>	2/3
CONTIA																	
1	..	112	..	17	17	15	142	33	2/3	∧	<	1/4	3/5	3/5	½	2/1	>
CONTIA																	
1	..	480	118	17	17	15	173?	73	¾	½	=	< ½	=	3/5	3/4	=	3/5
2	..	430	72	17	17	15	169	..	4/5	2/3	<	> ½	<	3/5	<	<	2/3
3	♀ ?	426	106	17	17	15	170	69	¾	2/3	=	> ½	<	3/5	4/5	>	2/3
4	♀ ?	442	106	17	17	15	173	71	¾	=	=	½	=	3/5	¾	=	3/5
5	♂ ?	498	128	17	17	15	174	79	4/5	=	=	2/5	<	3/5	¾	>	4/5
6	♂ ?	478	128	17	17	15	173	81	¾	=	<	½	<	3/5	¾	=	2/3
7	♂	417	125	17	17	15	150	87	¾	¾	=	>1/3	<	2/3	3/5	>	5/6
8	♂	248	63	17	17	15	173	77	¾	2/3	<	>1/3	<	2/3	<	>	4/5
9	♂	290	82	17	17	15	160	86	¾	½	=	3/5	<	2/3	<	>	5/6
10	♂	..	..	17	17	15	159?	92	¾	½	=	2/5	<	2/3	3/4	>	3/4

Nos. 1, 2, 3 & 4 are labelled *condoni* two of which were so pronounced referred to in his description of that species.

Loreal.	Praeocular.	Postocular.	Temporals.	Suprala-bias. Number.	Suprala-bias. Touching eye.	Posterior sublinguals. Length to ant. sub-linguals.	Posterior sublinguals. Infralabials in contact.	Posterior sublinguals. Separated or in con-tact.	No. of scales behind last infralabial.	Locality.	Where preserved.
COLLARIS (Menetriés).											
0	1	1	1+1	7	3rd & 4th	$\frac{3}{4}$	4th & 5th	cont	2	Muscat	171 F1 Bombay collection.
1	1	2	1+1	7	do.	$\frac{3}{4}$	do.	cont	2	Baghdad	171 F2 do.
1	1	2	1+2	7	do.	=	do.	cont	2	Baghdad	171 F3 do.
1	1	2	1+2	7	do.	<	do.	cont	2	Baghdad	171 F3 do.
SEBRINA spec. nov.											
0	1	1	1+2	7	3rd & 4th	$\frac{3}{4}$	4th & 5th	cont	2	Bazdad, S. Persia ..	171-1 Bombay collection.
CORONELLA (Schlegel).											
1	1	2	1+2	7	3rd & 4th	=	4th & 5th	sept	3	Shellal, Wadi-Guzzi, Palestine.	No. 19428 Indian Museum.
DECEMLINEATA (Dumeril & Bibron.) Synopsis of species.											
1	1	2	1+2	7	3rd & 4th	=	4th & 5th	cont	3 L 2 R	Shiraz	No. 171 G2 Bombay N.H.S. Collection.
1	1	2	1+2	7	3rd & 4th	=	4th & 5th	sept	3	do.	171 G3 do.
1	1	2	1+2	7	4th & 5thL 3rd & 4th R	=	do.	cont	2	do.	171 G4 do.
1	1	2	1+2	7	3rd & 4th	=	do.	sept.	3	do.	171 G1 do.
1	1	2	1+2	7	3rd & 4th	=	do.	cont	2	Maidan Mihaftan ..	456 do.
1	1	1	1+2	7	3rd & 4th	=	do.	do.	2	do. ..	457 do.
1	1	2	1+2	7	3rd& 4th	=	do.	do.	2	do. ..	458 do.
1	1	2	1+2	7	3rd & 4th	=	do.	do.	2	do. ..	171 E4 do.
1	1	2	1+2	7	3rd & 4th	=	do.	do.	2	do. ..	171 E1 do.
1	1	2	1+2	7	3rd & 4th	<	do.	do.	2	do. ..	171 E2 do.
by Boulenger and											

THE IDENTIFICATION OF INDIAN BUTTERFLIES.

By Lieut.-Col. W. H. Evans, D.S.O., R.E,, F.Z.S., F.E.S.

(*Continued from page* 537 *of this Volume.*)

Part III.

(*With* 4 *plates*).

D7. Maniola.—The Meadowbrowns. (Plate 13).

Upf the ocelli not pupilled or only rarely so in individuals.

1a (5a). H termen even, No ♂ brand, except in No. 3.

1b (4). Unh no prominent pale markings. Upf single apical ocellus; in ♀ rarely an ocellus in 2; ocelli not yellow ringed.

1 (2a). Upf bright tawny except for extreme base and margin. Unf discal line obsolete or nearly so, never shows above.

**pulchella*, *Fd.* (38-45). The Tawny Meadowbrown. Chitral—Kashmir N.R.

2a (1) Upf tawny area completely overlaid dark brown scales, less so in ♀. Unf discal line more or less prominent, especially in ♀, where it shows upf and beyond it there is a tawny area nearly clear of dark scales.

2 (3). Comparatively large, no ♂ brand.

pulchra, *Fd.* (40-45). The Dusky Meadow brown. Chitral—Kumaon. NR.

3 (2). Small. ♂ brand upf under mv.

hilaris, *Stg.* (34-36). The Pamir Meadowbrown. N. Chitral. VR.

4 (1b). Unh with prominent fulvous markings from base 8 to mid cell and a discal series of irregular fulvous or pale yellow spots. ♂ upf ocellus very obscure; ♀ apical ocellus and ocellus in 2 prominent and yellow ringed.

**cœnonympha*, *Fd.* (35-45). The Spotted Meadowbrown. Kashmir. NR.

5a (1a). H margin crenulate. ♂ upf broad dark brand from v1 to v3 or 4. ♀ usually ocellus in 2.

5b (7a). Unh no prominent ocelli, at most a very small one in 1.

5 (6). Above dark brown, only tawny beyond cell and about ocelli in female.

γ. ♂ upf ocelli not yellow ringed. ♀ uph discal line prominent and much paler beyond it.

lupinus centralis, *Riley.* (45-50). The Branded Meadowbrown. Baluchistan. R.

β. ♂ upf ocellus yellow ringed. ♀ uph uniform.

**lupinus kashmirica*, *M.* Chitral—Kashmir. NR.

γ. As last, but larger and fulvous ring round ocellus in ♂ and fulvous areas about ocelli in ♀ upf larger.

lupinus cheena, *M.* (50-60). Kashmir—Nepal. NR.

6 (5). Above tawny except for extreme base and border. Unf discal line obsolete. Unh paler and more striated, very irregular discal and sub-marginal line.

narica, *Hub.* (48-50). The Tawny Branded Meadowbrown. Baluchistan. R.

7a (5b). Unh prominent white ringed ocelli and prominent white edged discal line.

7 (8). Upf apical ocellus elongate.

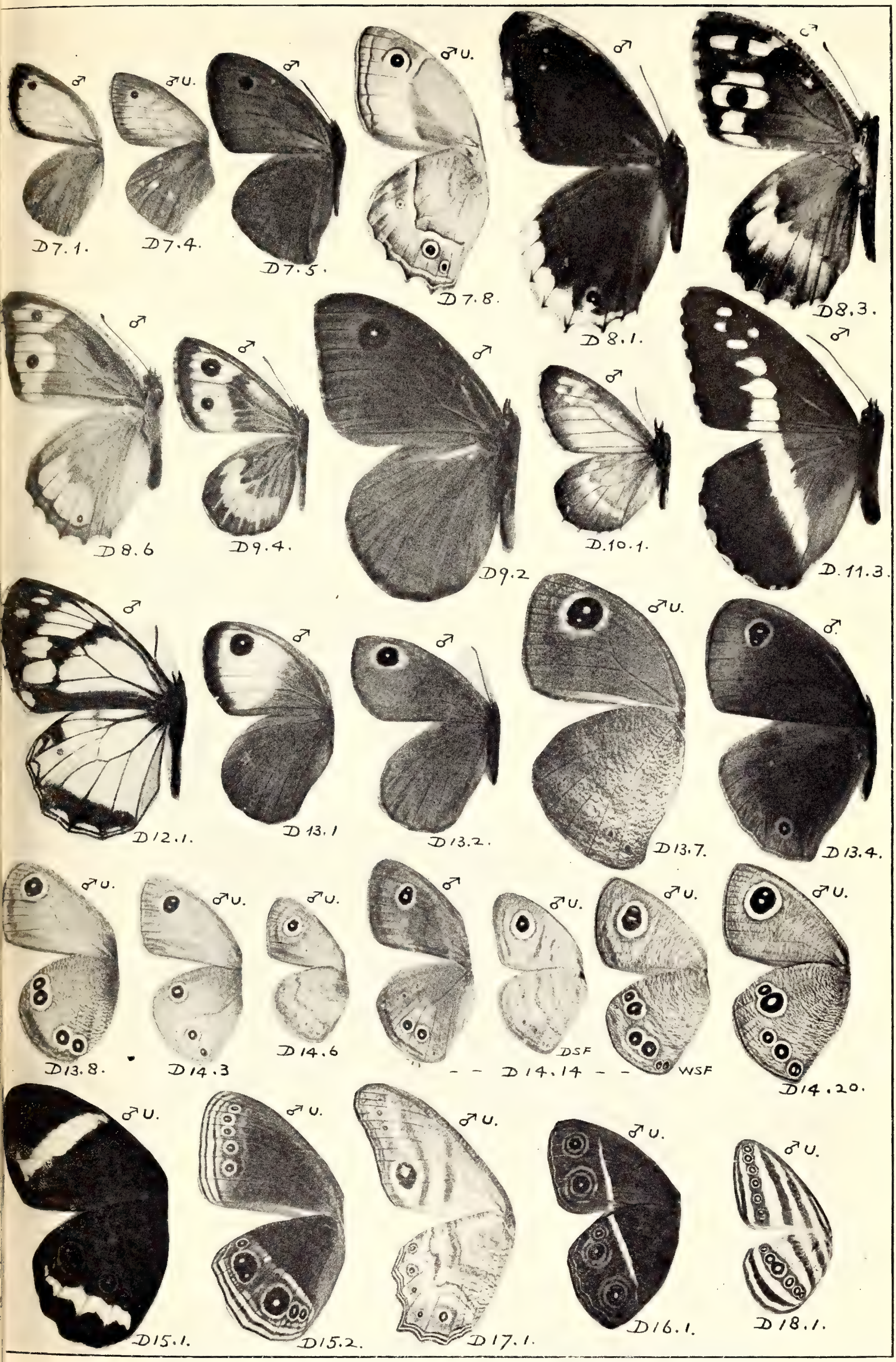
wagneri mandane, *Koll.* (50-52). The Ovalspot Meadowbrown. Baluchistan. VR.

8 (7). Upf apical ocellus circular.

Large. ♂ upf brand wide and extending into 3. Unh ocelli small, ocell in 1 and 5 very small or absent.

**davendra latistigma*, *M.* (52-55). The Whiteringed Meadowbrown. Baluchistan. NR.

β. Small. ♂ brand narrower and not into 3. Unh ocelli variable, often an extra ocellus in 6. Unf discal line prominent.


♂
D7.1.
♂ U.
D7.4.
♂
D7.5.
♂ U.
D7.8.
♂
D8.1.
♂
D8.3.
♂
D8.6
♂
D9.4.
♂
D9.2
♂
D.10.1.
♂
D.11.3.
♂
D12.1.
♂
D13.1
♂
D13.2.
♂ U.
D13.7.
♂
D13.4.
♂ U.
D13.8.
♂ U.
D14.3
♂ U.
D14.6
♂
♂ U.
DSF
♂ U.
D14.14
WSF
♂ U.
D14.20.
♂ U.
D15.1.
♂ U.
D15.2.
♂ U.
D17.1.
♂ U.
D16.1.
♂ U.
D18.1.

D. **Satyridae.** 7. *Maniola*: 8. *Eumenis*: 10. *Aulocera*: 12. *Arge*: 13. *Erebia*: 14. *Ypthima*: 15. *Zipoetis*: 17. *Erites*: 16. *Orsotrioena*: 18. *Ragadia*.

D7. Maniola—*contd.*

davendra chitralica, Evans. (48-52). Chitral NR.

λ. As last. Unh ocelli in 2 and 5 large and equal; ocellus in 1 usually absent.

davendra brevistigma, M. Baltistan—Ladak. NR.

η. Large and brand broad, but not into 3. Unusually an ocellus in 1. Unf discal line obscure.

davendra davendra, M. (50-55). Spiti—Kumaon. R.

D8. Eumenis.—The Rockbrowns. (Plate 13).

1 (2a). Above velvet black with white border, no discal band. Unh white edged discal line and prominent ocelli in 2 and 5. ♂ upf brand from v1-4.

α. Upf white marginal band unsullied. Uph ocellus in 2 small and mostly on the white area. Below paler, discal line straight.

parisatis shiva, LeCerf. (65-70). The White-edged Rockbrown. Baluchistan—Chitral and Hunza. NR.

β. Upf white margin narrow, sullied. Uph ocellus in 2 mostly on the dark area and large. Unh ocelli very large.

**parisatis parsis, LeCerf.* Kashmir—Kumaon. NR.

2a (1). Above with tawny or white band.

2b (4a). Unf broad dark bar in cell. Upf discal band consists of disconnected broad streaks, those in 2 and 5 being divided by an ocellus. Upf no ocellus in 1.

2 (3). Upf basal half of cell white; discal band white and always a streak in 4. Unf ocellus pupilled. ♂ upf broad brand.

heydenreichi shandura, Mar. (50-65). The Shandur Rockbrown. Chitral—Kashmir. R.

3 (2). Upf cell dark brown; discal band tawny in DSF and white in WSF, rarely streak in 4. Unf ocelli blind. ♂ brand narrow.

**persephone enervata, Stg.* (60-70). The Dark Rockbrown. Baluchistan—Chitral. NR.

4a (2b). Unf dark bar in cell narrow or absent, apical ocellus pupilled.

4 (5a). Upf ♂ tawny band suffused dark brown, except round ocellus; in ♀ pale tawny, sullied. Uph ocellus in-prominent. Unh broadly white beyond discal band. ♂ brand upf broad.

semele diffusa, But. (60-70). The Grayling. Ravi Basin. VR.

5a (4). Upf tawny band prominent and continuous, veins more or less dark. Uph ocellus in 2 small or absent.

5 (6). Uph tawny discal band continued into 6 or to costa. ♂ upf dark basal area not projecting prominently into discal band at v4. ♂ upf dark brand larger v1-4.

mniszechii lehana, M. (58-65). The Tawny Rockbrown. Baluchistan. Chitral—Ladak. NR.

β. As last but always smaller.

mniszechii baldiva, M. (50-55). Ladak, Kunawur, Spiti. NR.

6 (5). Upf tawny discal band not into 6. ♂ upf dark basal area projecting into discal band at v4. ♂ upf brand mid cell parallel to the scv.

**thelephassa, Hub.* (55-65). The Baluchi Rockbrown. Baluchistan. NR

D9. Karanasa.—The Satyrs. (Plate 13).

1a (3a). Upf single ocellus in 5.

1 (2). Upf broad tawny discal band; ocellus not pupilled.

α. Apex F produced. Upf discal band broad and light, veins only narrowly black.

D9. Karanasa.—(*contd.*)

igna pallas, Evans. (55). The Chitrali Satyr. Chitral to 9,000 feet NR.

. Apex F not produced. Upf discal band narrower, duller, veins broadly black, especially v4; outer edge discal band much zigzagged. Smaller.

digna digna, Mar. (52). Chitral over 9,000 feet. NR.

2 (1). Upf no tawny discal band; ocellus pupilled.

α. Small. Apex F produced. Upf ocellus small.

actœa nana, Stg. (50-55). The Black Satyr. Baluchistan. R.

β. Much larger. Apex F produced. Upf ocellus very large.

**actœa magna, Evans.* (60-65). Chitral to 9,000 feet. R.

γ. Small. Apex F rounded. Upf ocellus small.

actœa pimpla, Fd. (45-50). Chitral over 9,000 feet. R.

3a (1a). Upf ocelli in 5 and 2 on a pale band (ocellus in 2 rarely absent).

3 (4). Upf veins across pale band brown in ♂ and in ♀ vs 1 and 4 brown. Pale band yellow, but often more or less suffused tawny. Outer edge of discal band uph defined by a sawtooth line. Apex F produced. ♂ brand prominent.

regeli moorei, Evans. (45-55). The Turkestan Satyr. Chitral—Ladak. NR.

4 (3). Upf veins across pale band concolorous with ground, except sometimes at upper end. Pale band tawny; outer edge discal band uph defined by an even or waved line. Apex F not produced. ♂ brand faint.

**hubneri, Fd.* The Tawny Satyr. Safed Koh. Chitral, Ladak, Kashmir. N

D10. Paroeneis.—The Mountain Satyrs. (Plate 13).

Above brown with tawny band. Small. No ♂ brand.

1 (2). Upf tawny band ill-defined, diffused inwards, mostly tawny except for the dark border.

α. Above dark brown border narrow, confined to termen and ill-defined inwardly.

pumilus pumilus, Fd. (38-40). The Mountain Satyr. Kashmir, Ladak. NR.

β. Above dark brown border broad, up to edge of discal band.

**pumilus bicolor, Seitz.* (40-45). Chumbi Valley. NR.

2 (1). Upf tawny discal band narrow and well defined, Most of wing dark brown.

palœarcticus sikkimensis, Stg. (40-45). The Arctic Satyr. Sikkim. R.

D11. Aulocera.—The Banded Satyrs. (Plate 13).

Above black or very dark brown, discal band white or pale yellow. ♂ upf dark brand mid dorsum to v4 more or less prominent.

1a (5). Below dark, white striation less prominent than the dark ground. Tegumen with horns.

1 (2a). Upf inner edge white discal spots 1-4 in line. Uph band narrow and even. Wings rounded, termens convex. Tegumen gradually sloped to tip.

α. Unf apical ocellus well defined and prominently pupilled. Uph discal band to dorsum.

brahminus brahminus, Blanch. (55-65). The Narrow-banded Satyr. Kashmir —Mussoorie. NC.

β. Upf apical ocellus ill-defined. Uph discal band to dorsum, comparatively straight. Large.

brahminus dokwana, Evans. (65-68). W. Garhwal, Kumaon, Nepal. R.

γ. As last, but much smaller and darker. Uph band much curved.

brahminus brahminoides, M. (50-60). Chumbi Valley. R.

2a (1). Upf inner edge discal spots 1-3 nearer base and not in line with spot in 4, but more in line with inner spot in 5, if present. Tegumen with shoulder. Wings produced, termen F straight.

D11. Aulocera—(*contd.*)

2 (3). Uph band of even width throughout and veins crossing it black. Tegumen hooks short.

α. Upf inner spot in 5 absent in ♂. Uph band to dorsum in ♂, not always so in ♀. Unf ocellus prominently pupilled.

padma padma, Kollar. (70-85). The Great Satyr. Kashmir—Sikkim. NR.

β. Upf inner spot in 5 present in ♂ and ♀. Uph band to dorsum in ♂ and ♀. Unf ocellus often ill-defined.

padma loha, Doh. (80-92). Kumaon—Assam to 8,000 feet. NR.

λ. As last but much smaller and bands much narrower. Uph band curved and not as a rule to dorsum in ♂.

padma chumbica, M. (65-75). Bhutan, Chumbi Valley, over 9,000 feet NR.

δ. As last, but bands pale yellow above and bright yellow below. Occurs as a variety with *chumbica.*

padma fulva, Evans. (70-75). Abor Valley and S.E. Thibet, over 9,000 ft. R.

3 (2). Uph band distinctly narrowing to dorsum, which it never reaches except rarely in ♀ ; veins crossing it not darkened as a rule. Bronzy sheen above and below paler than last. Tegumen with very long hooks.

α. Uph band very narrow and not entering cell; upf spots of band well separated, only very faintly tinged yellow.

swaha kurrama, Evans. (60-65). The Common Satyr. Safed Koh. NR.

β. Uph band broad and enters cell; upf discal spots coalesced usually and larger. Above band pale straw, unf tinged pale yellow.

**swaha swaha, Koll.* (60-70). Chitral—Sikkim. C.

γ. As last, but upf band bright yellow.

swaha garuna, Fruh. Kashmir—Kulu, inner ranges. NR.

4 (1a). Below very pale, white striation predominant; white band broad and straight on H, reaches dorsum. Tegumen without hooks.

saraswati, Koll. (65-75). The Striated Satyr. Chitral—Sikkim. C.

D12. Arge.—The Marbled Whites. (Plate 13).

Above white with irregular sub-marginal brown line and upf narrow irregular brown discal band and dorsum brown. Unh ocelli in 1-3 and 5 and 6, often obscure.

**halimede montana, Leech.* (60-65). The Chinese Marbled White. N. Burma. VR.

D13. Erebia.—The Arguses. (Plate 13).

1a (4a). Antennæ club spatulate. Above velvet dark brown; upf ocellus single pupilled. (sometimes unpupilled and very rarely 2). Unf maroon. Unh dark brown, powdered white scales, no ocelli, complete postdiscal row white spots. No. ♂ brand.

1 (2a). Upf outer half wing yellow. Uph uniform dark velvet brown.

**mani, DeN.* (45-50). The Yellow Argus. Chitral—Ladak. R.

2a (1). Upf outer half not yellow. Uph obscure postdiscal ferruginous patch.

2 (3). Upf broad prominent postdiscal ferruginous area and apical ocellus prominently yellow ringed.

γ Upf ocellus not pupilled and upf no tawny patch.

kalinda chitralica, Evans. (45-50). The Scarce Mountain Argus. Chitral. VR.

β. Upf ocellus pupilled.

D13. Erebia—(*contd.*)

**kalinda, kalinda, M.* (45-50). Kashmir—Kumaon. R.

3 (2). Upf ferruginous area obscure and detached from ocellus, which has no yellow ring, except in ♀.

shallada, Lang. (45-55). The Mountain Argus. Chitral. Kashmir—Mussoorie. NR.

4a (1a). Club antennæ gradual.

4b (8a). Above velvet dark brown; upf ocellus bipupilled; uph an ocellus in 2. Unh at least an ocellus in 2.

4c (6a). Unh no sub-marginal brown fascia or line; discal brown line or fascia obscure or obsolete.

4 (5). Above uniform. No ♂ brand.

a. Unh finely irrorated; ocellus in 2 minute, no ocellus in 1, white spots 4, 5 and 6 obscure, also brown discal line traceable. Unf maroon.

nirmala reducta, Evans. (50-55). The Common Argus. Chitral. VC.

β. Unf dark brown and unh no white irrorations, ocellus in 2 prominent, usually no ocellus in 1 and rarely ocellus in 4, white spots prominent, no discal line.

nirmala daksha, M. (45-50). Kashmir. C.

γ. Transitional between last and next. Unf dark maroon, unh white irrorations weak, ocelli never so well developed as is usually the case in the next.

nirmala kala, Evans. (45-50). Murree. VC.

δ. Unf bright maroon. Unh white irrorations prominent and often broad discal line; ocelli very variable, may be only 1 or 2 or a complete row.

**nirmala nirmala, M.* (50-55). Kangra—Kumaon. VC.

5 (4). Above outwardly prominently paler. Unh white irrorations very prominent, especially towards dorsum; ocelli in 1 and 2 prominent and subequal, none elsewhere, white dots prominent. ♂ upf modified scales on disc.

scanda, Koll. (50-60). The Pallid Argus. Kashmir—Sikkim. NR.

6a (4c). Unh prominent sub-marginal and discal fasciæ or lines; striation prominent and uniform; never more than ocelli in 1 and 2.

6 (7). Unh prominent sub-marginal and discal lines, not fasciæ; submarginal line clear of the ocelli, which are prominent. F dorsum longer than costa. No ♂ brand.

hybrida, M. (50-60). The Hybrid Argus. Simla—Kumaon. NR.

7 (6). Unh prominent submarginal and discal fasciæ, not lines, and former runs into the ocelli; fasciæ widening to apex. F costa longer than or equal to the dorsum. In DSF unh fasciæ and ocelli tend to obsolescence.

a. Large. Upf narrow fulvous ring to ocellus. Apex F produced and termen straight. ♂ prominent area modified scales on disc upf.

annada annada, M. (60-70). The Ringed Argus. Kashmir—Sikkim. NR.

β. Smaller. Upf ocellus with a very broad ring. Apex F rounded. No modified scales in ♂.

**annada orixa, M.* (55-60). Assam—N. Burma. NR.

γ. As last, larger. Upf ocellus with even broader ring. Unh white irrorations very prominent also dark fasciæ and there is a prominent sub-basal fascia as well. No ♂ brand.

annada suroia, Tyt. (60-65). Manipur. R.

8a (4b). Above brown; ocellus with yellow, not fulvous ring.

8 (9). Uph prominent ocellus in 2. Upf second pupil to ocellus absent or minute. Below pale brown; unh striated and with 2 large double ocelli in 1-2 and 5-6, no discal line. No ♂ brand. Wings rounded.

**hyagriva, M.* (42-46). The Brown Argus. Kashmir—Kumaon. R.

D13. Erebia—(*contd.*)

9 (8). Uph and unh no ocelli. Unf prominent dark discal line from inside ocellus to vl and postdiscal line to vl, between which ground colour is paler. ♂ prominent dark brown brand mid 1 to base 4, entering cell. Wings produced, especially tornus H which is lobed.

a. Below rather pale brown, more or less frosted over white scales F and evenly striated H, no fasciæ.

narasingha narasingha, M. (55). The Mottled Argus. Abor Valley. VR.

β. Below paler and with an ochreous tinge, H not striated or uniform, costa, apex and tornus prominently darker.

narasingha dohertyi, Evans. (55). N. Burma—Shan States. VR.

D14. Ypthima.—The Rings. (Plate 13).

1 (2a). Unh no ocelli or at most a dot in 2. Uph ocellus in 2. Unh variegated, basal area and mid termen ochreous brown, rest nearly white. Unf no loop under ocellus or fascia. No ♂ brand.

megalomma megalia, DeN. (45). The Ringless. N. Burma. VR.

2a (1). Unh with ocelli, though often obsolete in DSF.

2b (11a). Unh single apical ocellus in 6.

2c (7a). Unh only 2 subtornal ocelli in 1 and 2, no ocellus in 3 and uph only ocellus in 2.

2d (5a). Unf no loop round ocellus extending to 1, or 2.

2e (4). Unf no prominent sub-marginal dark fascia, at least in WSF. ♂ with brand upf.

2 (3). Unh apical and tornal ocelli not in line, ocellus in 2 shifted out. DSF variable, may have a submarginal fascia unf and two discal fasciæ unh.

inica, Hew. (30-34). The Lesser Threering. Punjab—Bengal. NR.

3 (2). Unh apical and tornal ocelli in line. No DSF.

a. Unf striation obsolete. Below ochreous tinge. Upf ocellus ring obscure.

**lycus lycus, DeN.* (37-40). The Plain Threering. Assam. R.

β. Unf striation prominent. Below grey.

lycus lycoides, Wat. (37-40). N. Burma. R.

4 (2e). Below sub-marginal fascia F and mid termen H; no discal fascia F. No ♂ brand, no DSF.

a. Unf sub-marginal fascia prominent and widening at tornus. Unh apical ocellus not much larger than rest. Small.

nareda nareda, Koll. (40-45). The Large Threering. Kashmir—Kumaon. NR.

β. Unf submarginal fascia even. Unh apical ocellus much larger than rest and striation coarser.

nareda newara, M. (45-50). Sikkim—Assam. NR.

γ. As last, but smaller.

nareda sarcaposa, Fruh. (40-45). Assam—Shan States. NR.

5a (2d). Unf with discal fascia, which forms a loop under the ocellus with the sub-marginal fascia. No ♂ brand. With DSF.

5 (6). Large. Below striation coarse and wide. Unh in WSF ocellus very large.

watsoni, M. (40-45). The Looped Threering. Manipur—S. Burma. NR.

6 (5). Small. Striation below fine.

a. Unh WSF ocelli very small; in DSF 2 more or less prominent discal lines.

**asterope mahratta, M.* (30-37). The Common Threering. India. Chamba—Assam. C.

β. Unh WSF ocelli large; in DSF discal lines obscure or absent. Unf loop may be obscure.

D14. Ypthima—(*contd.*)

asterope burmana, Evans. (28-36). N. Burma. NR.

7a (2c). Unh 3 tornal ocelli in 1, 2 & 3. Uph usually ocelli in 2 & 3 at least. No ♂ brand.

7b (9a). Unh subtornal ocelli on a dark band. Seasonal forms not strongly marked.

7 (8). Upf dark bands from below invisible and ocellus ring obscure.

ypthimoides, M. (40-55). The Palni Fourring. S. India. NR.

8 (7). Upf dark bands and ocellus ring prominent. Below paler; H whitish, dark bands and ocelli rings prominent.

chenui, Guer. (36-46). The Nilgiri Fourring. S. India. NR.

9a (7b). Unh subtornal ocelli not on a dark band. Seasonal forms strongly marked.

9 (10). Uph tornal half white.

ceylonica, Hew. (30-35). The White Fourring. Ceylon. S. India—Bengal. C.

10 (9). Uph not white.

α. Below all fasciæ obsolete.

hubneri kashmira, M. (35-40). The Common Fourring. Kashmir—Kulu. NR.

β. Below all fasciæ usually prominent. Very variable, especially in DSF.

hubneri hubneri, Kirby. (30-40). India. Burma. VC.

11a (2b). Unh more than one apical ocellus and that in 5 always prominent.

11b (13a). Unh the tornal ocelli in a straight line or that in 2 slightly shifted out.

11 (12). Unh only 2 subtornal ocelli usually, ocellus in 3 absent. Unh 3 sub-apical ocelli in 4, 5 and 6. Below fasciæ prominent. No ♂ brand. No DSF.

bolanica, Mar. (35-40). The Desert Fourring. Baluchistan—Kashmir. R.

12 (11). Unh 3 subtornal and 2 subapical ocelli (rarely an ocellus in 4 and rarely that in 6 absent).

α. Small. ♂ upf no ocellus. Below pale; unf discal band may be absent. Unh no discal band. ♂ brand more or less prominent.

avanta singala, Fd. (30-35). The Jewel Fourring. Ceylon. S. India—Central Provinces. NR.

β. ♂ upf ocellus prominent. Below whitish, with prominent bands. ♂ brand absent.

avanta striata, Hamp. (35-45). Nilgiris. R.

γ. ♂ upf no ocellus. Below dark, markings more or less prominent. ♂ brand prominent.

avanta avanta, M. (32-38). Kashmir—Sikkim. NR.

δ. ♂ upf prominent ocellus. Pale and small. Below pale and fasciæ obscur ♂ brand faint or absent.

avanta cerealis, Wat. (32-36). Burma dry zone. R.

η. As typical avanta, but larger and striation below coarser.

avanta bara, Evans. (38-42). Sikkim—Burma. NR.

13a (11b). Unh tornal ocelli not in line, ocellus in 2 shifted in more or less.

13 (14a). Unh ocellus in 6 minute. Small. Uph no discal fasciæ. Unf no discal and sub-marginal fascia obscure. No ♂ brand. DSF well marked.

α. Unh discal fascia obsolete.

philomela tabella, Mar. (25-35). The Baby Fivering. S. India. NR.

β. Unh discal fascia always visible. Paler.

philomela peguana, Evans. N. Burma. NR.

14a (13). Unh ocellus in 6 more or less prominent. Larger.

14b (20a). Unh the 2 apical ocelli not prominently larger than the rest.

D14. Ypthima.—(*contd.*)

14c (17a). Under 45 mm expanse.

14d (16a). ♂ upf prominent brand; discal line not visible. DSF well marked.

14 (15). Below striation coarse and sub-basal band prominent as well as the discal. Uph discal line always more or less well marked.

a. Unh 2 apical ocelli usually well separated. WSF discal bands very often most prominent on a pale ground.

baldus madrasa, Evans. (36-43). The Common Fivering. S. India. VC.

β. Unh apical pair of ocelli and also central pair usually confluent. Small, pale, especially below, fasciæ more obscure.

baldus satpura, Evans. (32-36). Pachmarhi. NR.

γ. Very variable; unh in WSF ocelli often very large and confluent; dark and bands not so prominent as in *a*.

**baldus baldus, F.* (35-48). Chamba—Burma. VC.

15 (14). Below striation fine and darker; sub-basal bands F and H obsolete. Uph discal band not visible. NR.

indecora, Mar. (35-40). The Western Fivering. Kashmir—Kumaon.

16a (14d). ♂ upf brand absent and discal line visible F and H. Below sub-basal. fascia obscure.

a. Very dark, especially below. DSF strongly marked and variegated.

similis affectata, El. (38-42). The Eastern Fivering. Assam. R.

β. Very pale, below whitish, sparsely striated. Termen F very straight. DSF ocellated, not strongly marked.

similis yoma, Evans. (35-42). Pegu Yoma. R.

γ. Very like *baldus*. DSF ocellated, not strongly marked.

similis similis, El. (40-45). Karens—Dawnas. NR.

17a (14c). Over 45 mm expanse.

17 (18a). Below very pale with dark fasciæ very prominent and discal fascia H straight. Above pale, prominent ♂ brand. Unh tornal double ocellus separated. DSF strongly marked.

savara, GrS. (45-50). The Pallid Fivering. C.

18a (17). Unh discal fascia, if present, angled out opposite end cell, fasciæ never so prominent. DSF ocellated.

18 (19). Unh double tornal ocellus separated, apical pair separate.

a. Large and dark. No ♂ brand.

methora methora, Hew. (50-55). The Variegated Fivering. Sikkim—Assam R.

β. Smaller and rather paler. ♂ brand obscure. Below fasciæ very faint.

methora sobrina, El (48-52). Karen Hills. R.

19 (18). Unh double tornal ocellus with single iris, apical ocelli with irides touching or coalesced.

a. Dark. Below fasciæ absent on H and obscure on F. No ♂ brand. F produced. Unh ocellus in 5 shifted in.

dohertyi persimilis, El. (50-55). The Great Fivering. Manipur. VR.

β. Pale. Below whitish, sparsely striated, fasciæ obscure. ♂ brand prominent. Uph all ocelli showing.

dohertyi dohertyi, M. (52-56). Shan States—Karens. R.

20 (14b). Unh apical 2 ocelli much larger than the rest, tornal double ocellu with single iris. No DSF.

a. Small, dark, ocelli small. Unh apical ocelli separated by iris, the irides being coalesced. ♂ brand prominent or obscure. Below no fasciæ.

sakra nikaea, M. (45-50). The Himalayan Fivering. Murree—Kumaon. C.

β. Larger, paler, ocelli larger. Unh apical 2 ocelli with a single iris. ♂ brand obscure. Below no fasciæ.

sakra sakra, M. (48-55). Sikkim. C.

D14. Ypthima.—(*contd.*)

γ. As last, paler. Unf discal and sub-marginal fascia show obscurely and rarely also on H.

**sakra austeni, M.* (48-55). Assam—Karen hills. C.

D15. Zipoetis.—The Catseyes. (Plate 13).

Without dry season form.

1 (2). Velvet black with broad white band F and H. Unh 2 small tornal ocelli, large one in 2, double one 5—6, small one in 7, all inwardly bordered by a pale line.

**saitis, Hew.* (60-65). The Tamil Catseye. S. India. R.

2 (1). Above dark velvet brown, no pale bands; 3 very narrow sub-terminal lines; apex F paler. Unh ocelli as in last.

**scylax, Hew.* (55-62). The Dark Catseye. Sikkim—Shan States. NR.

D16. Orsotriœna.—The Nigger. (Plate 13).

Above dark brown, unmarked, but the discal band from below shows faintly. Below crossed by a white band. Unf ocelli in 2 and 5. Unh in 2, 5 and 6. DSF strongly marked.

α. Below white band broad and tapering to costa F and dorsum H.

medus mandata, M. (42-52). The Nigger. Ceylon, S. India. C.

β. Below discal band narrow and even; in DSF may be absent or replaced by a dark line.

**medus medus, F.* (45-55). Sikkim—Burma. Andamans, Nicobars. C.

D17. Erites.—The Cyclops. (Plate 13).

Seasonal forms slightly marked.

1a (3). Upf large ocellus in 2 only, remainder from below show faint. Apex F produced.

1 (2). Unh inner band sharply angled in middle as is the discal band. Uph ocelli with broad yellow rings.

**angularis, M.* (50-60). The Angled Cyclops. NR.

2 (1). Unh inner band straight or slightly curved, discal band sharply angled.

α. F termen concave opposite end v5. Upf ocellus in 2 pupilled. Uph ocelli small and narrow ringed, no bands showing. Unh ocelli small, bands broad and dark.

falcipennis falcipennis, WM. (50-55). The Common Cyclops. Cachar—Chin Hills. R.

β. F termen even. Upf ocellus not pupilled. Uph ocelli with broad rings and bands show through.

falcipennis rotundata, DeN. (50-60). Karen Hills—S. Burma. C.

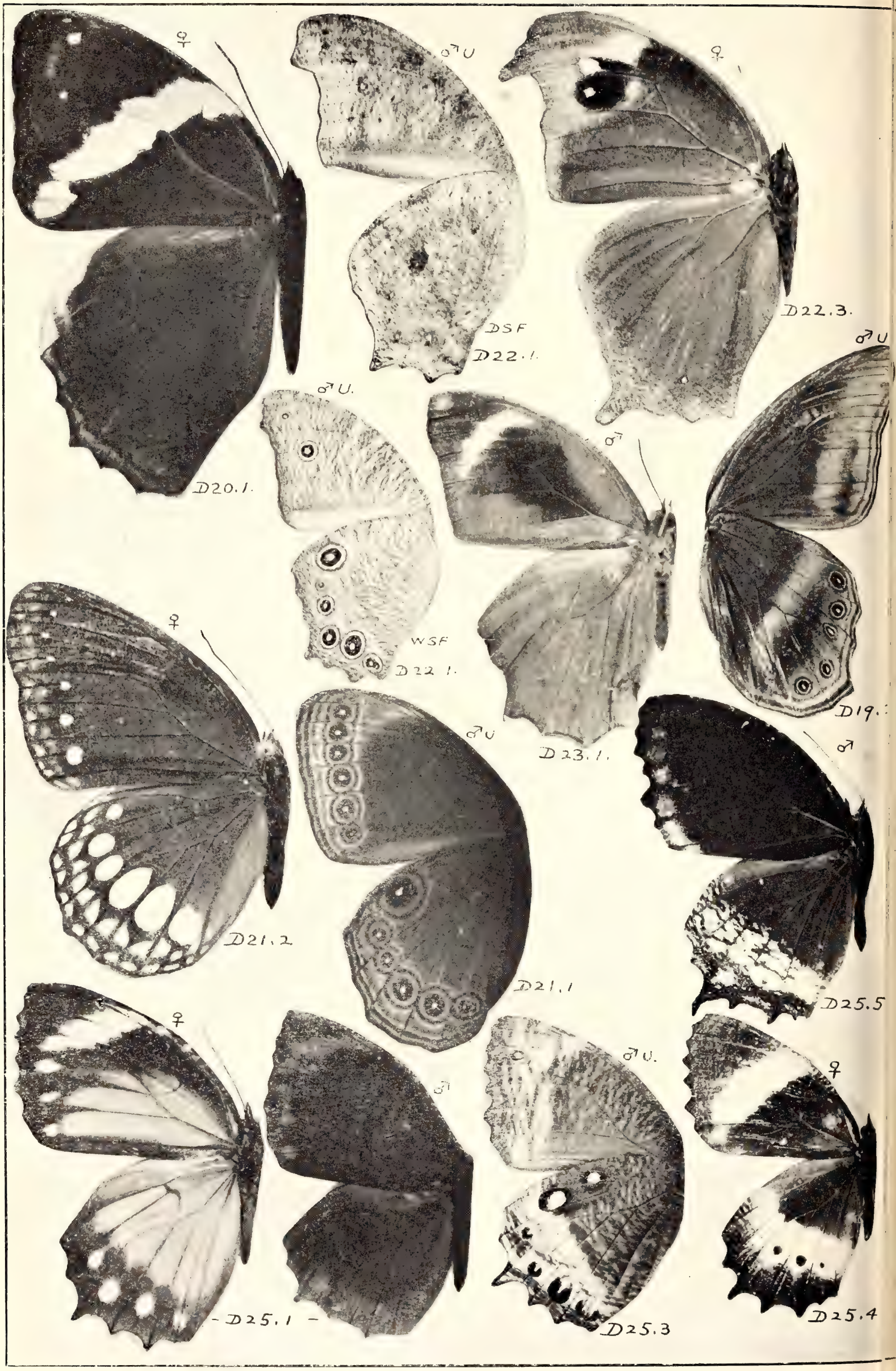
3 (1a). Upf all ocelli marked. Apex F not produced. Uph and unh as *rotundata.*

argentina delia, Mart. (50-55). The Eyed Cyclops. Tavoy—S. Burma. VR.

D18. Ragadia.—The Striped Ringlet. (Plate 13).

α. Above all 4 bands of the same shade, dusky. Unh ocelli in 3, 4 and 5 with irides conjoined.

crisilda crito, DeN. (42-46). Bhutan—Manipur. R.


♀
D20.1.
♂U
DSF
D22.1.
♀
D22.3.
♂U.
WSF
D22 1.
♂
D23.1.
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D19.
♀
D21.2
♂U
D21.1
♂
D25.5
♀
♂
D25.1
♂U.
D25.3
♀
D25.4

D. **Satyridae.** 20. *Neorina* : 22. *Melanitis* : 23. *Cyllogenes* : 19. *Coelites* : 21. *Anadebis* : 25. *Ely ias.*

D18. Ragadis—(*contd.*)

β. Above pale band (3rd from base) clear white, narrow. Uph sub-marginal band very narrow. Uph dark band bearing the ocelli below much wider than the pale bands on either side. Unh ocelli in 3, 4 and 5 with irides conjoined.

crisilda crisilda, Hew. (42-46). Cachar—Assam. NR.

γ. Above discal white band broader on F also sub-marginal band H, where the dark band bearing the ocelli below is only slightly wider than the pale bands; upf sub-marginal band narrow white. Unh ocelli in 4 and 5 with irides conjoined or separate.

crisilda critolaus, DeN. (42-46). Karens—Dawnas. R.

δ. Above as last, but smaller and darker, white bands narrower. Upf sub-marginal band may be obsolete.

**crisilda critolina, Evans.* (37-42). Dawnas to S. Burma. R.

D19. Cœlites.—The Blue Catseyes. (Plate 14).

Above dark brown, bases broadly glossed purple blue; below dull brown with a diffused pale band. ♂ uph long erect hairs along v1 and a prominent dark brand along outer two-thirds of v1.

1 (2). Unh ocelli in 4 ond 5 much smaller than ocelli in 2, 3 and 6; no discal band; dark discal line before ocelli angled out opposite end cell.

nothis adamsoni, M. (75-85). The Scarce Catseye. Bhamo. VR.

2 (1). Unh all ocelli small and equal, prominent pale straight discal band and no dark discal line.

**epiminthia binghami, M.* (75-85). The Blue Catseye. Dawnas—S Burma. R.

D20. Neorina.—The Owls. (Plate 14). No male brand.

1 (2a). H no tail at v3. Upf broad yellow discal band.

**hilda, Wd.* (80-95). The Yellow Owl. Sikkim—Assam. R.

2a (1). H tail at v3.

2 (3). Upf broad white discal band. Uph no ocelli.

patria westwoodi, M. (100-110). The White Owl. Assam—N. Burma R.

3 (2.) Upf broad yellow discal band. Uph ocelli in 2 and 3.

chrishna archaica, Fruh. (95-105). The Tailed Yellow Owl. S. Burma. VR.

D21. Anadebis.—The Diadems. (Plate 14). No male brand.

1 (2). Above and below complete postdiscal row ocelli.

**himachala, M.* (60-85). The Dusky Diadem. Sikkim—N. Burma. NR.

2 (1). Above and below complete postdiscal row white spots, which are very large on H.

* *diademoides, M.* (80-90). The White Diadem. Karens—S. Burma. R.

D22. Melanitis.—The Evening Browns. (Plate 14). No male brand.

1 (2a). WSF below grey, striated dark brown, with large prominent ocelli. Upf always prominent, white pupilled, black spot in 3, extending into 4 and a white spot against its upper, outer, edge; paler above the spot. DSF the black and white spots prominent, with on the inner and lower side a narrow, promi-

D22. Melanitis—(*contd.*)

nent, sharply defined ochreous bar; in 5 a similar ochreous bar that very rarely extends above 5. F produced; in WSF termen just angled below v5, prominently so in ♀ and in DSF ♂, falcate in DSF ♀. H termen equally tailed at v1. and v3.

**leda ismene, Cr.* (60-80). The Common Evening Brown. Ceylon, India, Burma, Andamans. VC.

2a (1). WSF never with large ocelli below. DSF ochreous markings never so restricted and so well defined.

2 (3). WSF below ocelli small, but more or less complete and usually well formed. DSF with termen ashy, especially so in ♂. F WSF apex not produced and termen straight or very faintly angled below v5. H WSF tailed only at v3 and termen straight to tornus; DSF tail at v1 much shorter than tail at v3.

α. WSF ♂ above very dark, unmarked, apex F paler; ♀ upf black spots prominent, white spots small or absent, pale area above to costa. Below ♂ very dark, ♀ ferruginous, ocelli not so well formed as usual. DSF no ochreous markings upf, black and white spots more or less prominent and pale costal bar.

phedima tambra, M. (70-80). The Dark Evening Brown. Ceylon. NR.

β. Smaller and not so dark. WSF below ocelli well developed and discal line prominent, ferruginous.

phedima varaha, M. (60-70). S. India. NR.

B. WSF with costal ochreous bar beyond cell, no black and white spots; ♀ entire apex ochreous with small pupilled ocellus in 3, indistinct black spot above and 2 small apical black spots. DSF broad yellow apex, entering cell and to margin in ♀, black and white spots prominent in ♀, small and well separated in ♂ as in ♀ WSF.

phedima bethami, DeN. (75-85). Pachmarhi. NR.

δ. As large as *tambra.* WSF ♂ below bands ill-defined. DSF upf ochreous mark in ♀ as in No. 1, but not sharp defined and reaches costa.

phedima galkissa, Fruh. (60-75). Kashmir—Kumaon. NR.

η. As last, but larger and darker, especially in DSF. DSF ♂ ochreous costal bar present.

phedima bela, M. (65-80). Sikkim—N. Burma. C.

ξ. As last, but smaller. DSF ochreous markings reduced. Below ocelli or spots smaller. WSF below tornus edged rich reddish brown.

phedima ganapati, Fruh. (65-75). Karen Hills—S. Burma. C.

3 (2). WSF below small white spots rather than ocelli. DSF margins not ashy.

α. Above DSF and WSF nearly alike; black spots more or less prominent, especially white spots in ♂; margin F shining black in ♂ (slightly powdered in DSF), dusted ochreous in ♀ (especially in WSF); pale costal bar beyond cell dusky in ♂, dull ochreous in ♀. Below dark discal line prominent in WSF and apex in ♂ yellowish. DSF pale smoky, with black basal patches, more prominent in ♂. F produced and termen prominently angled below v5, falcate in ♀.

zitenius gokala, M. (75-85). The Great Evening Brown. S. India. R.

β. As next, but smaller and apical ochreous area very wide, black spots prominent.

zitenius kalinga, M. (75-85). Godaveri Valley. R.

γ. WSF upf black spots obscure and white spots usually absent: prominent costal ochreous bar, which, especially in ♀, is often continued nearly to the tornus outside the black spots. DSF ochreous markings wider, black and white spots prominent and ochreous area encircles them; ocherous area reaches termen in ♀. Shape as in No 1 in both seasonal forms.

**zitenius zitenius, Herbst.* (80-95). Kumaon—Karen hills. NR.

D22. Melanitis—(*contd.*)

δ. Above ♂ WSF unmarked and ground colour with a dull ferruginous tinge. ♀ black spots absent or at most 2 small dots in 3 and 4; the ochreous costal bar continues as a broad even discal band to tornus, where it becomes duskier. DSF as last, smaller and ochreous markings more restricted.

zitenius auletes, Fruh. (75-85). Dawnas—S. Burma. R.

η. DSF as γ. WSF ♂ upf ochreous costal bar restricted to 5 and 6, no black or white spots; ♀ ?

zitenius andamanica, Evans. (70-85). Andamans. R.

D23. Cyllogenes.—The Evening Browns. (Plate 14).

1 (2). Above strong purple tinge. Upf apical yellow band narrow and not to termen. ♂ upf large black brand bases 2-5 and end cell.

**suradeva, M.* (75-85). The Branded Evening Brown. Sikkim—Bhutan. R.

2 (1). Above no purple tinge (faint in ♀). Upf yellow band broad and reaches termen. No ♂ brand.

janetæ, DeN. (90-95). The Scarce Evening Brown. Bhutan—Assam. VR.

D24. Parantirrhoea.—The Travancore Evening Brown.

Above dark brown with a prominent violet purple band upf. ♂ upf brand on dorsum and wing folded over in middle, v1 much distorted; upf prominent brand near end v1.

marshallii, WM. (55-65). The Travancore Evening Brown. Travancore. VR.

D25. Elymnias.—The Palmflies. (Plates 14-15).

1a (12a). ♂ upf no brand; uph brand base 6, extending to cell and 7, covered by tuft of hairs, whch may be in 1 or 2 pencils.

1b (5a). F apex not produced.

1a (3a). ♂ tuft in 2 pencils.

1 (2). Upf margin not chestnut, usually with blue or white spots. ♀ tawny with white banded black apex upf.

α. ♂ uph margin broad yellow; upf blue spots faint. ♀ uph margin ochreous.

hypermnestra fraterna, M. (60-80). The Common Palmfly. Ceylon. C.

β. ♂ ♀ long tail at v3 H. ♂ upf blueish white spots prominent. ♀ uph white sub-marginal spots obsolete.

hypermnestra caudata, But. (65-80). S. India. NR.

γ. As α but ♂ uph margin chestnut and upf blue spots prominent. ♀ uph margin dark brown.

**hypermnestra undularis, Drury.* Bengal. Dun—N. Burma. C.

δ. As last, but upf ♂ blue spots more developed and contiguous, extending often to upper part H. ♀ dark margin broader.

hypermnestra tinctoria, M. S. Burma. C.

♀ *v. paraleuca, Fruh.* Uph disc whitish. NR.

2 (1). Upf margin chestnut. ♂ ♀ alike. Above unspotted, except rarely in ♀.

α. Above chestnut margins very wide and pale.

cottonis obnubila, Mar. (65-75). The Chestnut Palmfly. Karen Hills—S. Burma. R.

β. Chestnut margins narrow and dark. ♀ uph with obscure sub-marginal white spots.

D25. Elymnias.—(*contd.*)

cottonis cottonis, Hew. (70-80). Andamans. NR.

3a (1a). ♂ tuft single. H caudate at v4.

3 (4). Unh prominent ocelli, appearing uph in ♀ on a pale margin.

**panthera mimus, WM.* (65-75). The Nicobar Palmfly. Nicobars. R.

4 (3). Unh no ocelli. ♂ ♀ above dark brown, broad oblique white band F and H, bearing outwardly on H a row of white dots.

**dara dædalion, DeN.* (60-65). The White-banded Palmfly. Dawnas—S. Burma. VR.

5a (1b). F apex produced. ♂ tuft single in No 9, double in rest.

5b (11). Termens scalloped.

5c (7a). Upf dark brown with no discal markings. H caudate.

5 (6). Above narrow pale margin F and H outer third pale yellowish white, striated dark brown.

**singhala, M.* (75-90). The Ceylon Palmfly Ceylon. NR.

6 (5). Above termen broadly dull blue and dull chestnut at tornus H (bright chestnut in ♀). Unh white spot in 7 prominent.

pealii, WM. (75-85). Peal's Palmfly. Assam. VR.

7a (5c). Above markings not confined to margin.

7 (8a). Above dull greenish blue, all veins broadly black. Caudate.

α. Above streaks between veins blueish.

**nesœa timandra, Wall.* (75-85). The Tiger Palmfly. Sikkim—N. Burma. NR.

β. Above streaks greenish; in ♀ veins broad chestnut instead of black.

nesœa cortona, Fruh. S. Burma. NR.

8a (7). Upf dark brown with discal blue or white markings and apex shot blue. Only caudate in *saueri.*

8b (10). Upf markings consist of spots, 2 spots in 3 and often in 2.

8 (9). Upf ♂ spot in cell and basal half of 2.

α. As next, smaller. Uph irregular white terminal spots. Below more broadly white streaked and dotted.

malelas nilamba, Fruh. (75-85). The Spotted Palmfly. Kumaon, Nepal. R.

β. ♀ uph whitish, striated dark brown, veins broad black. Below dull, basal half hardly striated; outer half evenly striated.

**malelas malelas, Hew.* (80-100). Sikkim—Karens. NR.

9 (8). Upf no spot in cell. Below highly variegated, rather as No. 7, mottled and striated all over. H more dentate. ♀ upf apex ferruginous.

casiphone saueri, Dist. (80-95). The Malayan Palmfly. Dawnas—S. Burma. VR.

10 (8b). Upf markings consist of broad blue or purple stripes, single in 3 and 2. Uph postdiscal row small white spots. ♂ ♀ alike.

α. Large.

patna patna, Wd. (80-100). The Blue Striped Palmfly. Kumaon—N. Burma. NR.

β. Smaller. H apex rather acute and termen straight.

patna patnoides, M. (75-90). Karen Hills. R.

11 (5b). Termens even. Apex F sharp pointed and termen concave below. Upf with broad discal blue streaks.

**penanga chelensis, DeN.* (70-75). The Pointed Palmfly. Assam—Burma. VR.

12a (1a). ♂ upf brand mid 1a, covered by recumbent tuft hairs; uph brand as in rest, tuft single.

12 (13). Upf blueish white with broad black veins. Uph dorsal two-thirds white or yellowish, unmarked. Unh dorsal half yellow and usually at base 1a and 1 a black bordered red area.

D25. Elymnias—(*contd.*)

a. ♂ above black veins well separated. Uph white.

vasudeva vasudeva, M. (80-90). The Jezabel Palmfly. Sikkim. R.

β. DSF upf greenish yellow spaces; H yellow; ♀ F all blueish white with narrow black veins. WSF nearly as next.

**vasudeva deva, M.* (80-90). Assam. R.

γ. ♂ more streaked green and in ♀ broad black veins form a confluent discal band. Unh ♀ red basal area absent.

vasudeva burmensis, Fruh. (80-90). Burma. R.

13 (12). Above dark brown with termen broadly blueish green. Apex F not produced, costa no longer than dorsum.

esaca andersonii, M. (60-65). The Green Palmfly. Mergui. VR.

E. Amathusiidæ. The Amathusiids.

1a (10a). F dcv a tubular vein throughout. H v1a always longer than the body, if v1 is as long as v2.

1b (7a). H cell completely open.

1c (4a). F lower end cell nearer termen, ends at angulation of v4.

1d (3). F vs 11 and 12 free.

1 (2). F origin v10 from before half way along v7, far from origin v9; upper dcv long, lower nearly straight. H quadrate. ♂ uph small tuft mid v1.

Xanthotænia, Wd. Pan. (Plate 15).

2 (1). F origin v10 from beyond half way along v7; origins 8, 9 and 10 close together; upper dcv very short, lower very concave at upper end. ♂ uph brand about base 6 and a prominent tuft from 1 below base cell; there may be a brand on 1a near tornus, covered by a tuft. F dorsum bowed.

Faunis, Hub. The Fauns (plate 15).

3 (1d). F vs 11 and 12 anastomosed, cell as in No 2. ♂ tuft along v1a near tornus uph, inconspicuous.

Æmona, Hew. The Dryads. (Plate 16).

4a (1c). F lower end cell nearer base, angulation of v4 far beyond end cell.

4 (5a). F vs 11 and 12 free, v10 absent, ♂ uph brand above origin v7 and tuft from base cell; unf brand in 1a near base.

Stictopthalma, Fd. The Junglequeens. (Plate 15).

5a (4). F vs 10 and 11 anastomosed to v12

5 (6). F vs 5 and 6 well separated at base, 6 much nearer 7. H v4 nearly touches v5. ♂ unf base 1 & 1a polished; uph tuft from cell near base, brand as in last may be present.

Thaumantis, Hub. The Jungleglories. (Plate 16).

6 (5). F vs 5 and 6 approximate at base, far from v7. H v5 curved, not angled. ♂ abdomen with prominent dark tuft of hairs on either side; uph small tuft on 1a and with or without a very large black brand with its centre at base of 7, covered by a tuft of hairs from base cell and a second tuft from base 6.

Thauria, M. The Jungleking. (Plate 15).

7a (1*b*). H cell closed more or less, tornus produced and more or less lobed.

7b (9). F no spur from v4.

7 (8). F all veins free. ♂ uph fold and tuft in 1a and long erect hairs along base v1; abdomen with a tuft on either side.

Amathusia, F. The Palmking. (Plate 16).

8 (7). F vs 11 and 12 anastomosed. ♂ uph large dark brand in 2, extending to base of 1 and 2; prominent tuft below v1 near base, v1 distorted at base and hairy.

Amathuxidia, Stg. The Kohinoor. (Plate 16).

E. Amathusiidæ—(*contd.*)

9 (7b). F v4 with spur towards v5 from its angulation beyond cell : vs 10 & 11 anastomosed to 12. ♂ unf dorsum polished and bowed, v1 also bowed ; uph with 3 tufts overlying brands, *viz.*, base 7, near base cell, near end cell and also a fourth erectile tuft on v1 towards base, v1 much distorted.

Zeuxidia, Hub. The Saturns. (Plate 16).

10a (1a). F dcv incomplete as a tubular vein in the middle. H produced, v1 as long as v2, but v1a not longer than body.

10 (11). F v10 present ; vs 10 and 11 anastomosed to v12. ♂ uph brand about base 3 and in 1a.

Discophora, Bdv. The Duffers. (Plate 16).

11 (10). F v10 absent ; v11 anastomosed to v12. ♂ uph prominent large hairy patch all over cell.

Enispe, Db. The Caliphs. (Plate 16).

E1. Xanthotænia.—Pan. (Plate 15).

Above chestnut brown ; upf with prominent yellow band and sub-apical spot. Below ocellated, ground yellow brown.

**busiris, Wd.* (60-70). Pan. Dawnas—S. Burma.

E2. Faunis.—The Fauns. (Plate 15).

1a (3). Above fulvous brown, no dark markings showing through. ♂ no brand on v1a.

1 (2). Below uniform dark brown, discal yellow spots small, dark lines dull, discal line much curved at ends and on H looped to the basal line.

**arcesilaus*, F. (65-75). The Common Faun. Sikkim—Burma. C.

2 (1). Below pale discal spots very large, dark lines narrow and prominent, straighter, on H looped to the outer line.

a. Below pale spots yellow. Unf discal line straight at upper end, looped to outer line at lower end.

eumeus assama, Wd. (85-95). The Large Faun. Assam. R.

β. Below pale spots white. Unf discal line curved at upper end.

eumeus incerta, Stg. (80-90). Shan States. VR.

3 (1a). Above smoky whitish with dark bands showing through from below ; H tornal area broadly yellow. Below very prominent dark bands on a smoky ground. ♂ uph brand on v1a.

**faunula faunuloides, DeN.* (100-112). The Pallid Faun. VR. (The plate represents typical *faunula* from the Malay peninsula).

E3. Aemona.—The Dryads. (Plate 16).

1 (2). Above ochreous yellow with dusky apex F, no veins darkened. In DSF outer discal band uph obscure and ocelli from below showing through more or less.

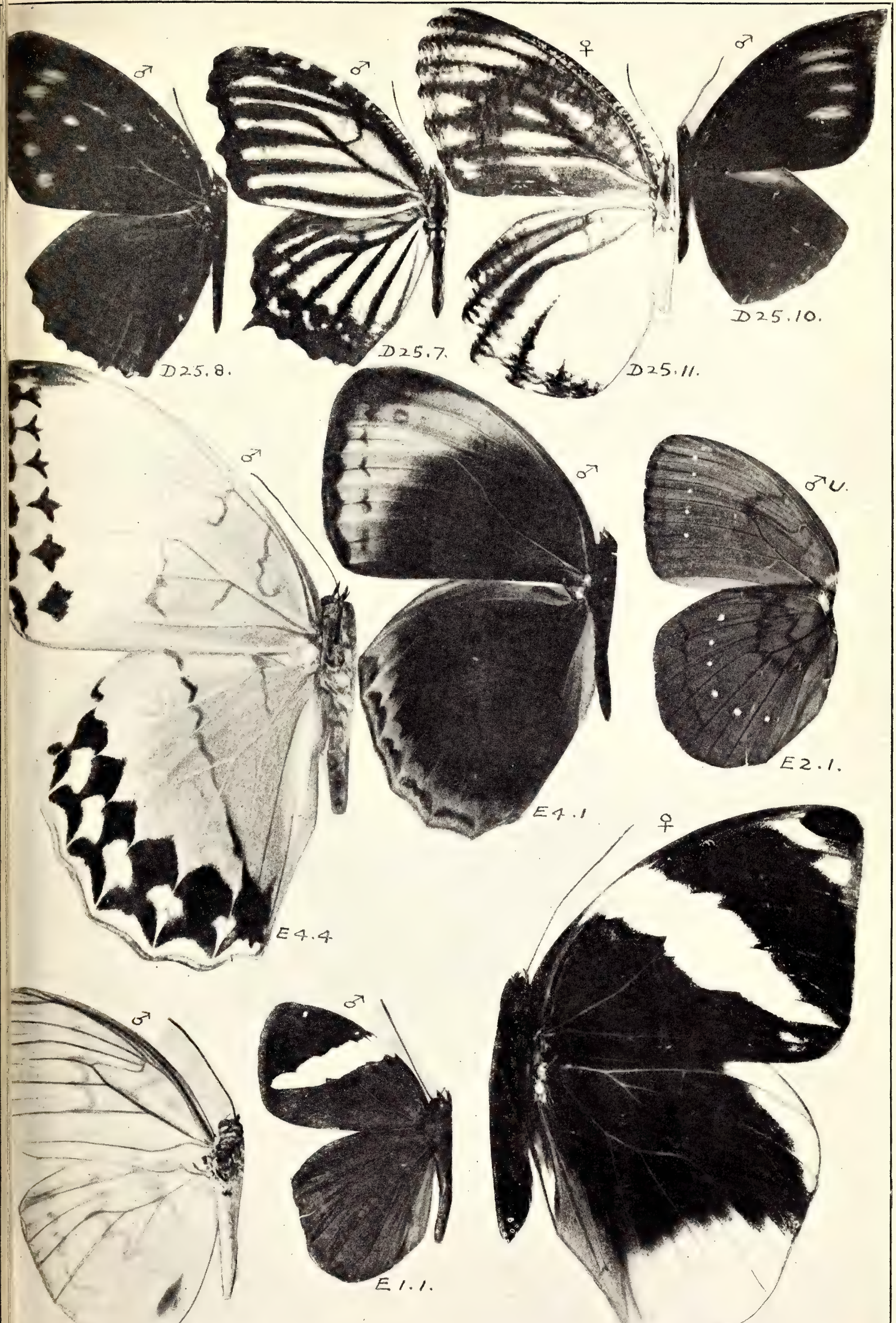
amathusia, Hew. (75-90). The Yellow Dryad. Sikkim—Assam. R.

2 (1). ♂ upf apex and termen whitish with darkened veins : in ♀ above entirely whitish except ochreous tornal area H.

**lena, Atk.* (80-100). The White Dryad. Shan States, Karen Hills. R.

E4. Stictopthalma.—The Junglequeens. (Plate 15).

1 (2a). Uph submarginal dark line narrow. Above bright chocolate brown; broad yellow pre-apical band F and margin H.


♂
D25.8.
♂
D25.7.
♀
D25.11.
♂
D25.10.
♂
E4.4
♂
E4.1
♂U.
E2.1.
♀
E6.1.
♂
E2.3
♂
E1.1.

D. **Satyridae.** 25. *Elymnias.*
E. **Amathusiidae.** 4. *Stictopthalma*: 2. *Faunis*: 1. *Xanthotaenia*: 6. *Thauria.*

E4. Stictophalma—*contd.*

α. Upf pre-apical band to tornus; uph yellow margin broad. Above inner sub-marginal markings obscure or absent.
nourmahal nurinissa, DeN. (95-105). The Chocolate Junglequeen. Bhutan. R.

β. Upf pre-apical band not to tornus; uph yellow margin narrow. Above inner sub-marginal markings narrow and prominent.
**nourmahal nourmahal, Wd.* Native Sikkim. Naga Hills R.

2a (1). Uph dark sub-marginal marking large and prominent.

2 (3a). Uph no dark spots on a pale ground inside the broad dark sub-marginal line; basal area bright chocolate brown from base merging into dark brown disc, whence margin is blueish white, bearing the dark sub-marginal band. Upf base chocolate brown, outer area blueish white.

α. Above milky white. Uph pale terminal area narrow.
camadeva camadeva, Wd. (125-150). The Northern Junglequeen. Sikkim. NR.

β. Above milky white areas suffused violet.
camadeva nicevillei, Rob. Assam. NR.

γ. Paler. Upf golden yellow costa and small chevrons. Below transverse lines straighter.
camadeva nagaensis, Roth. Naga Hills. VR.

δ. Pale. Uph pale terminal area much wider and sub-marginal band narrower.
camadeva camadevoides, DeN. N. Burma R.

3a (2). Uph a postdiscal series of conspicuous black spots adjoining the dark sub-marginal line on the inside.

3b (5). Uph no conspicuous series pale discal spots inside the postdiscal row.

3 (4). Above yellow, base F and all H suffused darker fulvous. Uph postdiscal spots shield shaped and broadly joined to the sub-marginal band.
howqua sparta, DeN. (140). The Chinese Junglequeen. Manipur. VR.

4 (3). Above outer half F and termen H white, bases fulvous. Uph postdiscal spots diamond shaped, joining the sub-marginal line narrowly and looking like arrowheads.

α. Above white areas faintly tinged yellow, basal areas bright, rather dark, fulvous.
**louisa tytleri, Roth.* (125-150). The Burmese Junglequeen. Manipur—N. Burma. NR.

β. Above much paler, white areas tinged lilacine.
louisa louisa, WM. Karen Hills—S. Burma. NR.

5 (3b). Uph conspicuous series diamond shaped white spots inside the postdiscal band of conjoined spots, making three marginal pale bands. Upf also with 3 rows of white spots, inner row ending in a large pale costal area. Ground colour above greenish steel blue, washed olive brown.
godfreyi, Roth. (125-140). Godfrey's Junglequeen. Tavoy—S. Burma. VR.

E5. Thaumantis.—The Jungleglories. (Plate 16).

1 (2). Above dark brown with a prominent iridescent blue discal band on each wing. Below uniform dull dark brown. ♂ tuft small, no brand.
**diores, Wd.* (95-115). The Jungleglory. Sikkim—Burma. NR.

2 (1). Above brilliant metallic blue to base, no discal band. Below base and margin paler. ♂ with tuft and brand.
lucipor, Wd. (100-110). The Dark Jungleglory. S. Burma. VR.

E6. Thauria.—The Jungleking. (Plate 16).

Above dark brown, pale discal band F; H costa narrowly and tornus broadly bright chestnut ochreous.

1 (2). ♂ uph no brand or tuft around cell. ♂ discal band yellowish and broad; ♀ band white and broader.

**lathyi amplifascia, Roth.* (110-120). The Jungleking. Manipur—Karen Hills. R.

2 (1). ♂ uph with large brand and tufts about cell.

a. Upf band wide.

aliris intermedia, Crow. (110-120). The Tufted Jungleking. N. Burma. VR.

β. Upf band narrow.

aliris pseudaliris, But. Karen Hills—S. Burma. VR.

E7. Amathusia.—The Palmking. (Plate 16).

a. Above dark brown, yellow pre-apical band on F and subterminal band H in ♂. Below dark and all markings prominent; H only 2 ocelli.

**phidippus friderici, Fruh.* (100-125). The Palmking. S. India. Karens—S. Burma. R.

β. ♂ above ferruginous brown, unmarked. Below paler and markings fainter; H 3 or 4 ocelli. ♀ yellow banded.

phidippus andamanica, Fruh. Andamans. R.

E8. Amathuxidia.—The Kohinoor. (Plate 16).

Above dark brown, upf broad band, pale blue in ♂, yellow in ♀: uph unmarked. Below pinkish lavender with dark lines prominent and 2 ocelli H.

**amythaon, Wd.* (110-130). The Kohinoor. Sikkim—Burma. R.

E9. Zeuxidia.—The Saturns. (Plate 16).

1a (3). ♂ uph with prominent blue border.

1 (2). ♂ uph blue border not above v4 and widening to tornus. Upf blue band narrowing to tornus. ♀ upf white discal band and white spots becoming yellow outwardly; uph terminal area rather obscure yellow.

**amethystus masoni, M.* (110-120). The Saturn. Karen Hills—S. Burma. R.

2 (1). ♂ uph blue border continued to costa and narrowing to tornus. ♀ upf marked as in last, but all markings violaceous.

doubledayi chersonesia, Fruh. (110-120). The Scarce Saturn. Dawnas—S. Burma. VR.

3 (1a). ♂ uph no blue border; upf blue area extending along cell and costa nearly to base. ♀ spots pure white and apex H white. ♂ unf prominent white brand in 1 near base; uph dark blue area cell to tornus and shining area in cell.

aurelius. Cr. (140-160). The Great Saturn. Mergui. VR.

E10. Discophora.—The Duffers. (Plate 16).

1a (3a). ♂ uph brand in 3 large, not pale edged and so not conspicuous nearly reaches v5.

1 (2). ♂ ♀ with black or yellow spots, no discal continuous band.

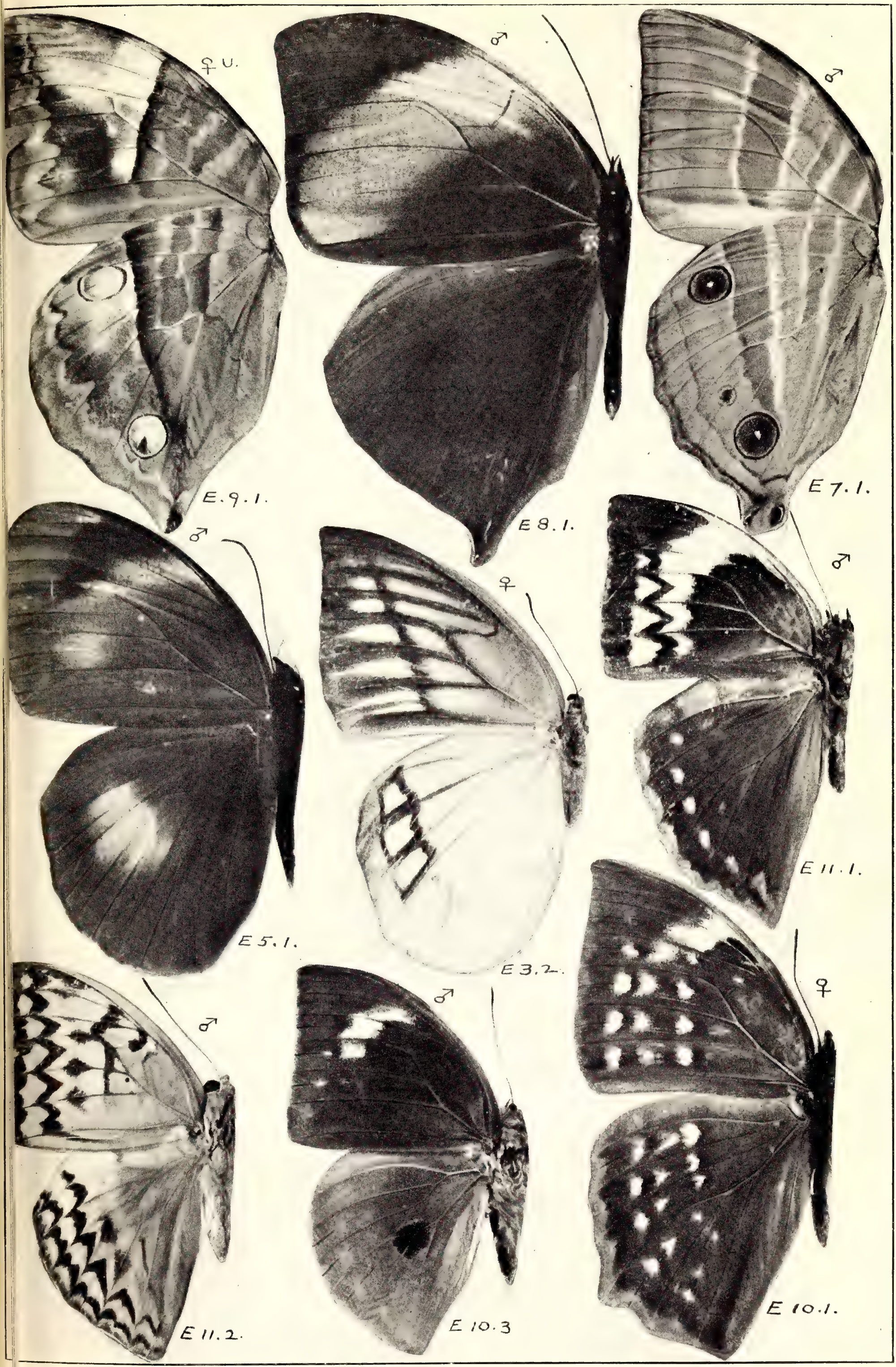
a. ♂ upf all 3 rows black spots equally prominent; H no spots.

tullia muscina, Fruh. (80-90). The Common Duffer. N. Kanara. VR.

β. ♂ upf rows of spots not equally prominent. ♂ ♀ upf spots blueish white and ♀ with a yellow patch end cell, enclosing a black spot; ♂ uph with spots.

**tullia zal, Wd.* (80-90). Sikkim—Burma. C.

v. indica, Stg. ♂ uph no spots. ♀ yellow patch end cell absent. NR.


♀ u.
E.9.1.
♂
E8.1.
♂
E7.1.
♂
E5.1.
♀
E3.2.
♂
E11.1.
♂
E11.2.
♂
E10.3
♀
E10.1.

E. **Amathusiidae.** 9. *Zeuxidia*: 8. *Amathuxidia*: 7. *Amathusia*: 5. *Thaumantis*: 3. *Aemona*: 11. *Enispe*; 10. *Discophora*.

E10. Discophora—(contd.)

v. spiloptera, DeN. ♂ upf yellow spots. ♀ yellow patch end cell not enclosing black spot. R.

2 (1). ♂ ♀ upf with broad yellow discal band.

deo, DeN. (90). The Banded Duffer. Manipur—N. Burma. VR.

3a (1a). Uph brand in 3 small, pale edged and very prominent, not nearly to v5.

3 (4). ♂ upf with blueish white spots and ♀ with a blueish white band and spots and uph yellow spots.

a. ♂ upf blueish white spots obscure. ♀ lower part of discal band more broken up into spots.

lepida ceylonica, Fruh. (85-95). The Southern Duffer. Ceylon. R.

β. ♂ apical blueish white spots prominent and conjoined.

**lepida lepida, M.* S. India. R.

4 (3). ♂ upf with yellow spots. ♀ upf with yellow discal band and spots and uph with yellow spots.

a. ♂ upf yellow spots more or less prominent.

continentalis continentalis, Stg. (85-100). The Great Duffer. Bengal. Sikkim—Burma. NR.

β. ♂ yellow markings upf obscure except for an elongated spot near base 6. ♀ termen yellow edged.

continentalis andamensis Stg. Andamane.

E11. Enispe.—The Caliphs. (Plate 16).

1 (2). Above dark brown with blueish white spots and band upf; uph obscure yellow spots in ♂, prominent in ♀.

a. Upf band narrower and becoming macular posteriorly. ♂ uph yellow spots fairly prominent.

cycnus verbanus, Fruh. (85-95). The Blue Caliph. Bhutan. Cachar. R.

β Upf band broader. ♂ uph yellow spots absent.

**cycnus cycnus, Wd.* Assam—N. Burma. R.

2 (1). Above brick red with black bands and spots.

euthymius, Db. (80-95). The Red Caliph. Sikkim—Burma. NR.

**v. tessellata, M.* Above dark markings broader; upf black line in continuation of black markings defining end cell. NR.

Notes.—The arrangement of the *Danaidæ* is as usual. A specimen of the very rare *Euplœa klugii rœpstorfii* (C.3.6) was obtained by Mr. G. Field in the S. Andaman Island on Dec. 12th, 1921. *Hestia lynceus reinwardtii* (C1.1) is new to India and was obtained by Mr. Cooper in Mergui in January 1922.

Every author differs regarding the arrangement of the *Satyridæ*. I have commenced with the Chinese group, following on with the Palæarctic and ending with the Oriental genera. Under *Pararge* I have included *Rhaphicera*. Following Moore (Lep. Ind. II. 6) I have avoided using the generic name *Satyrus*. *Mycalesis maianeas* (D.2.1) is a new species to India and was obtained by Mr. G.R.E. Cooper in Mergui in Jan. 1922. What I have called *Maniola hilaris* (D 7. 3.) was obtained recently by Gen. Tytler from Chitral; I have similar specimens from Central Asia. The following are new names; *Lethe nicevillei* (D.3.9.); *pulahina* (D.3.47); *Karanasa digna pallas* (D.9.1); *actæa magna* (*D*.9.2); *Aulocera brahminus dokwana* (D.11. 1); *swaha kurrama* (D.11.3); *Erebia nirmala reducta* and *kala* (D.13); *kalinda chitralica* (D.13.2); *narasingha dohertyi* (D.13.9); *Ypthima asterope burmana* 4(D.14. 6); *avanta bara* (*D*. 14·12); *philomela peguana* (*D*. 14·13; *baldus madrasa* and *satpura* (D.14.14).; *similis yoma* (D.14. 16); *Ragadia crisilda critolina* (D. 17); *Maniola davendra chitralica* (D. 7·8.). *Lethe irma* (D·3·9B) is a new species obtained by Major F. M. Bailey in September 1922.

The arrangement of the *Amathusiidæ* is as usual. *Zeunidia aurelius* (E.9.3) is new to India, having been obtained by Mr. Cooper in Mergui in Jan. 1922.

On account of alterations since going to press, the following corrections are needed to the plates. Plates 11 and 12. D 3, increase all numbers from 10 to 51 by 1; thus for D 3. 38 read D 3. 39. Plates 14 and 15. For D 25. 10 and D 25, 11 read D 25. 11 and D 25, 12.

NOTES ON HUGH WHISTLER'S "A CONTRIBUTION TO THE ORNITHOLOGY OF CASHMERE" IN VOL. XXVIII, No. 4.

BY

CAPT. R. S. P. BATES.

(*With a Plate.*)

The Jungle Crow—*Corvus coronoides intermedius.*

Everywhere common the moment one leaves the main valley. I met with them in the Sind Valley at the end of June as high as 13,000 feet.

The Yellow-billed Blue Magpie—*Urocissa flavirostris.*

On May 31st at Rajpur I took a nest containing 3 eggs, and noticed another pair building. They were common here between 6 and 8,000 feet.

The Crested Cole Tit—*Parus melanolophus.*

Very common in the Deodar forests from about 7,000 up to 10,000 feet. Nest containing 6 fresh eggs on May 31st above Rampur (between the Wular Lake and the Lolab Valley) about 8,000′ and nests with young ones in same place on June 3rd, 1921, and at Imaslwara 7,000 feet on June 6th, 1921.

The Western Streaked Laughing Thrush—*Trochalopterum lineatum.*

Clutch of 3 eggs brought to me by gujars near Imaslwara (about 7,500 feet) on June 3rd.

The White-cheeked Bulbul—*Pycnonotus leucogenys.*

On my way down to the Wular on May 22nd I was shown a nest, containing eggs, inside an upper room of a dwelling house in a village close to the canal bank. The female was sitting, although the room was occupied by the female members of the household. I cannot now remember how it was placed, but I think it was a thatched roof, and the nest was more or less wedged into a crevice in the thatch.

The Himalayan Tree Creeper—*Certhia himalayana.*

Five fresh eggs, June 1st, in Deodar forest on the eastern slopes of the Lolab Valley (8,000′). The nest was about 5 feet from the ground. At the beginning of July I noticed these birds were very noisy, and were going about in bands or family parties.

The Great Reed-warbler—*Acrocephalus stentoreus brunnescens.*

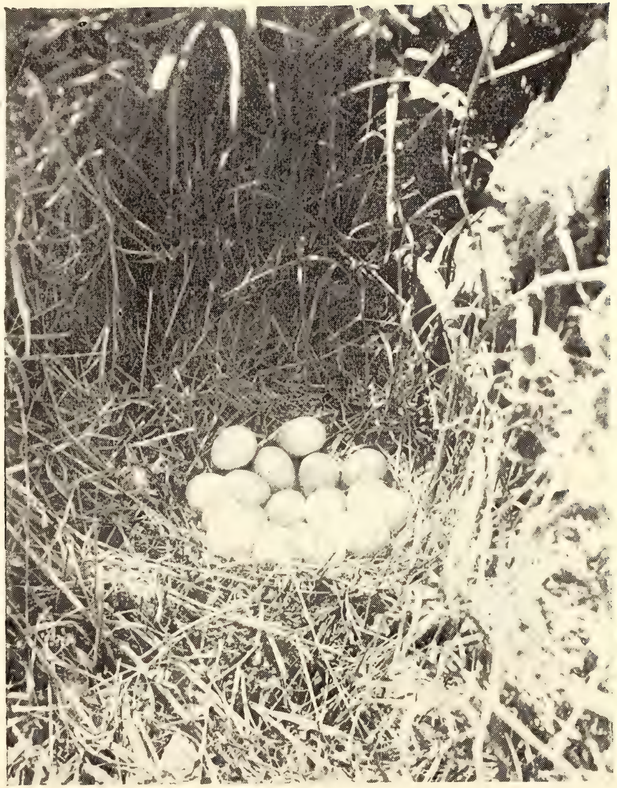
The first nest I took was on June 4th in the Wular Lake, and contained two eggs. After that date I took many nests in the Dhal Lake, some quite close to the gate. In 1921, I took nests with eggs in the Dhal Lake on June 12th and at Hokra Jhil on June 21st. One bird actually pitched on the rim of its nest, when I was inspecting the contents.

The Brown Bush-warbler—*Horeites pallidus.*

Heard them frequently in the Sind and Liddar valleys. Capt. Livesey showed me the eggs from a nest he took on the hill side above the Takht-i-suleman about the 20th June 1921.

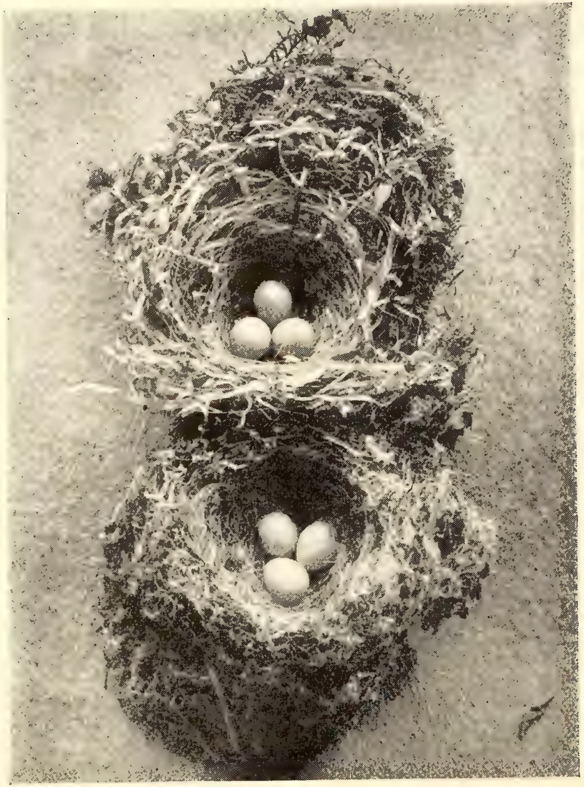
The Indian Lesser White-throat—*Sylvia curruca affinis.*

At the end of May I found many of their nests in low prickly bushes on the Western shore of the Wular. I too thought there was no doubt about this bird's identity, so I neither collected specimens nor took eggs. I also noticed they were common in the Liddar Valley from Pahlgam downwards, wherever there was suitable undergrowth.



Chukor's Nest and eggs.

(*Alectoris gracca chukor.*) (Abnormal clutch of 21 eggs.)



1. Nest and eggs of the White eyebrowed Blue Flycatcher (*Muscicapa superciliaris*).
2. Nest and eggs of the Sooty Flycatcher (*Hemichelidon siberica.*)

The Large Crowned Willow-wren—*Phylloscopus occipitalis occipitalis.*

Took a nest in a hole in a stump at Imaslwara (7,000′) on June 6th, 1921. It contained 4 eggs and also an egg of the Himalayan Cuckoo (*Cuculus saturatus*). Other nests, containing young ones, at Liddarwat at the beginning of July.

The Greenish Willow-wren—*Phylloscopus nitidus viridanus.*

A Willow-wren, which I took to be this species, was breeding abundantly from about the Valley level up to 10,000′ or more. By the end of June only nests containing young ones were to be found.

The Golden Oriole—*Oriolus oriolus kundoo.*

Nest in pear tree at Kunus, Wular Lake, on June 1st, 1921. Watched one building at the summit of an enormous chenar at Bundipur on May 25th, 1921.

The Rufous-backed Shrike—*Lanius schach erythronotus.*

Plenty of eggs by half way through May.

The Cashmere Red-breasted Flycatcher—*Muscicapa parva hyperythra.*

Empty but newly completed nest near Imaslwara 7,000′ on June 3rd. Capt. Livesey subsequently took a number of nests with eggs in this neighbourhood a few days later.

The White-eyebrowed Blue Flycatcher—*Muscicapa superciliaris.*

Nest in crevice of a Birch tree at Liddarwat at about 10,000′ on July 4th, 1921. 3 fresh eggs.

The Rufous-tailed Flycatcher—*Alseonax ruficaudus.*

Three fresh eggs at Imaslwara (8,000′), June 5th, 1921.

The Paradise Flycatcher—*Tchitrea paradisi paradisi.*

Nest with 3 incubated eggs in fruit tree at Watlab, June 7th, 1921.

The White-capped Redstart—*Chaimarrornis leucocephala.*

I met with them first on May 26th on the Madmatti a couple of miles above Sonerwain. In the Liddar Valley, at the beginning of July, 1921, I found them breeding at Sekwas (11,000′) and between Liddarwat and Kolahoi (also between 10 and 11,000′). I only saw one bird below Liddarwat at that time of the year.

The Plumbeous Redstart—*Chaimarrornis fuliginosa fuliginosa.*

Very common on all the side rivers and torrents, there being about one pair to every quarter of a mile or so. Absent from the valley, where the currents are sluggish. 4 eggs, incubated, Sonerwain, May 27th; 3 young ones, Sarwan, June 26th; 4 eggs. incubated, and ? eggs, Aru July 7th. Young ones, Pahlgam, July 8th.

The Blue Rock Thrush—*Monticola solitaria pandoo.*

Nest lately vacated by young on May 30th; 3 eggs nearly fresh, June 10th; 4 eggs, May 31st, 1921; building June 7th, 1921. (All on western shore of Wular Lake).

The White-capped Bunting—*Emberiza stewarti.*

This bunting appears to stick to the slopes around the valley, ascending them for about a 1,000′. Their place is then taken by *E. cia stracheyi*, which is to be met with for about another two thousand feet. As far as I could make out the two species do not overlap. This would account for Mr. Whistler's failing to detect the latter. They both breed profusely throughout their range. *E. cia stracheyi* is much victimized by the European Cuckoo (*Cuculus canorus*).

The Striated Swallow—*Hirundo daurica.*

Noticed them flying about Lake Gagrabal in June.

Hodgson's Pipit.—*Anthus roseatus.*

I found them breeding in large numbers between the Sind and Liddar valleys from 11,000′ up to the snow-level. They are most partial to wet ground. In fact I never saw them away from the streams and snow sodden ground. By the beginning of July there were many young birds about. I only found one nest with eggs (3) and these were almost on the point of hatching. This was on the 1st July 1921.

The Brown Rock Pipit.—*Anthus sordidus Jerdoni.*

Nest containing young ones at Watlab on June 7th, 1921.

The Grey Wagtail.—*Motacilla cinerea melanope.*

I found them on the Madmatti from Sonerwain onwards at the end of May. Seems to be an early breeder, as I was not able to find unincubated eggs.

The Cashmere White Wagtail—*Motacilla alba hodgsoni.*

Found a nest at Bundipur on May 23rd with large youngsters almost ready to leave the nest. I also found other nests with young about this time. A pair started building inside a rolled-up chick on my houseboat on May 20th. At Pahlgam on July 8th, I came across a nest with 5 quite fresh eggs in it.

Hodgson's Yellow Wagtail—*Motacilla citreola calcarata.*

Breeds in enormous numbers in June around such jhils as Hokra and the marshes between that jhil and the Wular, prefering to place the nest at the foot of a bush or in a tuft of long grass on wet ground.

The Cashmere Blue-throat—*Luscinia suecica abbotti.*

Took a nest of what was evidently this species at Sekwas, Liddar Valley (11,500 feet) on July 1st, 1921. It contained 4 eggs decidedly hard set.

The Iron-grey Bush-chat.—*Oreicola ferrea ferrea.*

Took two nests near Pahlgam on 8th July 1921. One contained newly hatched young; the other 4 incubated eggs. Also noted pairs at Rajpur (6,500 feet), Wular Lake on June 2nd, 1921, and at Imaslwara (6,500 feet) on June 6th, 1921, but failed to find the nests.

Jerdon's Accentor.—*Prunella strophiatus jerdoni.*

Very common above forest level between the Sind and Liddar valleys at the end of June. Practically every patch of Juniper I investigated held a nest. The majority appeared to be laying, and numbers were still building. Only one nest near Kem Sar and at about 12,500′ contained 3 eggs. I am not at all certain that my identification of this Accentor is correct, as I collected no specimens. The nests were like those of the "Hedge-sparrow" and 2′ or 3′ from the ground.

The Himalayan Whistling Thrush—*Myiophoneus temmincki temmincki.*

Capt. Livesey took incubated eggs halfway through May in the Ferozpore nala. On the Madmatti I found nests towards the end of May in both 1920 and 21, which appeared to have been lately evacuated, and was unable to find any nest in actual use. At the beginning of July I took nests in the Liddar Valley from Liddarwat down to Pahlgam usually within a few yards of a used nest. Three contained 1, 2 and 3 eggs respectively, and on four more the females were sitting. Of these two were in inaccessible situations, and two were still empty. It seems to me to be likely that two broods are brought up in the year

Tickell's Ouzel.—*Turdus unicolor.*

In May and June nests were plentiful.

The Himalayan Pied Woodpecker—*Dryobates himalayensis.*

Very common in the forests from about 6,500′ upwards. An early breeder. All the nests I found at the end of May and beginning of June contained young ones.

The Pied Kingfisher—*Ceryle rudis leucomelanura.*

Breeds freely during May and June in the Srinagar plain and also on the less turbulent lower reaches of the side rivers. Their place in the side valleys is then taken by the Himalayan Pied Kingfisher, a larger bird of a more retiring nature, which dives from a perch, is partial to wooded country, and which delights in hurling itself into the most agitated portions of the rapids.

The European Bee-eater—*Merops apiaster.*

Bee-eaters were constructing their nesting holes in sand banks on the hillside at Kunus on the Wular Lake at the end of May. I also noticed them near Gagrabal on June 3rd. They seem to live on the hillsides and to fly down into the valley in the mornings and evenings.

The Hoopoe—*Upupa epops epops.*

Nesting freely in May.

The Cuckoo—*Cuculus canorus.*

As stated above, its chief victim in Kashmir appears to be the Eastern Meadow Bunting, *Emberiza cia stracheyi.* Thus the Cuckoos' main habitat is the hillsides from 6,000 to 8 or 9,000′. Capt. Livesey has taken their eggs at the end of May and in early June. On June 18th and 21st I visited Hokra jhil, well out in the Srinagar plain, and on both dates I heard the cuckoo calling there.

The Slaty-headed Parrakeet—*Palæornis schisticeps.*

Fairly common up to between 7 and 8,000′, certainly not higher. In the early mornings I used to see many crossing over from and into the Lolab by the pass at Rampur. They used the vicinity of the pass only. I never saw them crossing over the higher hills to right or left of the pass.

Pallas' Fishing Eagle—*Haliaëtus leucoryphus.*

I noticed two pairs on my way down in the houseboat from Srinagar to the Wular on May 22nd.

The Hobby—*Falco subbuteo.*

Fairly common in Kashmir up to considerable elevations. I also saw one down in the valley near the Wular Lake on May 23rd.

The Indian Turtle Dove—*Streptopelia orientalis meena.*

Common in the forests up to considerable elevations.

The Chukor Partridge—*Alectoris græca chukor.*

Photographed a nest (reported by Capt. Livesey) containing 21 eggs, at Kunus, Wular Lake, on May 28th.

The Black Partridge—*Francolinus vulgaris.*

When I went down on June 10th the Black Partridge were calling lustily most of the way.

The Water-hen—*Gallinula chloropus.*

Breeding in the reed-beds in the Dhal Lake in considerable numbers at the beginning of June.

The Pheasant-tailed Jacana—*Hydrophasianus chirurgus.*

I saw numbers on the Dhal Lake on May 14th but did not take a nest until June 7th. This contained 4 fresh eggs.

The Red-wattled Lapwing—*Sacrogrammus indicus.*

Two pairs appeared to be nesting on the Madmatti a couple of miles above Bundipur at the end of May. I saw them in the very same place in May 1921.

The Black and White Stilt—*Himantopus candidus.*

Many seen on the mud flats in the Wular Lake on June 8th, 1921.

The Common Sandpiper—*Tringa glareola.*

I found them excessively common on the lower reaches of the side rivers. They nest among the bushes on the many small Islands, which abound in these rivers. On the Madmatti they were especially plentiful, and I remember finding 4 nests on one small island about 50 yards long on May 25th.

The Whiskered Tern—*Hydrochelidon leucopareia indica.*

I took one egg on May 14th in the Dhal Lake. On May 22nd a Kashmiri brought me about 20 (they are very good eating). In 1921 they were still laying as late as June 21st, as on that date I collected many fresh eggs on Hokra jhil.

The Little Grebe—*Podiceps ruficollis capensis.*

I saw a Little Grebe adding weeds to a nearly completed nest on May 15th in the very middle of the Dhal Lake opposite the Shalimar Bagh, and I took many nests with full clutches in the reed-beds close to the Dhal gate on June 6th.

ELEPHANT CATCHING IN ASSAM.

BY

A. J. W. MILROY.

Elephants are caught in Assam by two methods, *Mela Shikar* and *Kheddahs*. The former consists of pursuing the wild herds with tame elephants carrying nooses, and this method, together with pitting (now illegal), has been practised from very ancient times.

Three or four *koonkies*, as the tame elephants are called, usually operate together at *mela shikar*, and it is considered desirable that one of the elephants should be a big male of known courage in case any of the wild elephants prove aggressive. Each *koonkie* has 3 attendants, the *phandi*, who sits on the neck and throws the *phand* (or noose), the *lohitiya*, who hangs on behind and prods the *koonkie* near the root of the tail when speed is required, and the *kumla*, who remains in camp and is responsible for feeding the *koonkie*.

The catching gear consists only of the jute *phand*, which is attached to the *koonkie's* girth.

The *koonkies* can often work their way undetected into the middle of a herd when it is feeding in open order, provided the locality has not been much hunted recently, but the wild elephants soon become exceedingly wary, and will then fly both farther and faster from the smell of a tame elephant than they will from man.

In such case there is no alternative but to pursue, and try to cut off and noose those calves, which cannot go the pace and which fall behind. The whole performance, with the screaming of the elephants and the smashing of the jungle, is very noisy and terrifying, as may be imagined, but serious accidents are uncommon, as a matter of fact, and such damage as befalls the men is usually caused by thorns and branches of trees tearing and bruising them.

Female elephants, whose calves have been noosed, will sometimes attempt a rescue, but good *koonkies* will always square up to the attacker and drive her away.

The big males of a herd seem to prefer keeping to themselves some little distance off and, when danger threatens, are among the first to seek safety in flight, provided the *koonkies* do not get in their way: an elephant in *musth* constitutes more of a problem, and the *phandis* draw off, if there is any danger of coming into conflict with a male, that is under this dangerous influence.

Phandis necessarily vary greatly in skill but it commonly happens, even in the case of the most expert, that the noose does not get home properly on the wild elephant's neck, and it is then necessary to call for a *phand* to be thrown from a second *koonkie*.

Quite big elephants can be caught by this method, but in the case of such the first noose scarcely serves more than to brake the headlong pace of the terrified beast, and assistance has to be summoned at once to prevent an escape.

The *phands* may be 2 inches or more in diameter, but even these ropes are not always heavy enough to take the strain, and the writer has known a big *mukhana* (tuskless male) break 7 ropes in succession before he could be finally secured.

Mela shikar leads to a number of the wild elephants being unavoidably strangled, and it is fortunate that this form of death is very instantaneous on account of the structure of the elephant's wind-pipe.

The *koonkie* proceeds to put on the brake as soon as the *phand* is round the wild elephant's neck, and then the tug-of-war begins, the wild animal doing all it knows to escape from the unaccustomed restraint. It is the *phandi's* concern gradually to shorten the rope until the captive is secured close alongside his own animal, and he can only do this by seizing such opportunities as occur between bouts of pulling and struggling. The noose has to be tied by a small piece of rope to prevent it slipping up and throttling the elephant, and it cannot but happen occasionally that the noosed elephant gets so hopelessly wound up round trees and so on that the *phand* tightens and death ensues.

Kheddahs in Assam are worked on a less pretentious scale than those organized in Mysore, or formerly practised by the now defunct Kheddah Department, and no attempt is made to surround herds with a large number of men and then force them into a hastily erected stockade.

Stockades in Assam are built either across main elephant paths or else in the vicinity of salt-licks, which the elephants visit of their own accord from time to time.

The herds are bound in most districts in Assam to travel from one feeding ground to another by certain well-worn paths. Wherever the ground is favourable they can wander, may be several miles, from the main paths, but it generally happens that sooner or later steep hills or boggy ground, etc., etc., compel them to return to their fixed paths, which follow the safest and easiest lines across country with unerring accuracy, representing, as they do, the result of the accumulated wisdom and experience of countless generations of travelling elephants.

The most favourable stockade sites are in ravines, through which the driven elephants must seek to pass, unless they have the courage to break back through the beaters.

It is necessary that a stockade should not be too obvious to the approaching animals, and so it must be built in thick tree forest, where camouflaging can be successfully practised.

Very rocky ground is avoided because of the difficulty in sinking the posts to the requisite depth, and it would obviously be impossible to build sufficiently strongly on marshy soil. Stockades vary in shape according to the locality, but are generally more or less oval or oblong, about a cricket pitch wide and a few yards more in length.

A gate at each end is necessary where elephants can be driven from either direction, and the gates have to be built across the path itself : a skilful band of hunters, who know their work thoroughly, often prefer to build their stockade across a subsidiary path, trusting to their own skilful management to deflect the driven elephants (from whichever direction they may come), from the main on to the subsidiary path ; this arrangement saves labour as it obviates the necessity of constructing more than one gate.

The best site for a gate is clearly where the path passes between two trees, because the trees can then be utilized as door-posts and, more important, because there is no artificial narrowing of the path, the elephant being accustomed to squeeze between the two trees at this spot.

Drop-gates used to be employed, but these are cumbrous to lift up, and heavy swing doors, 10 to 12 feet high, made after the pattern of an ordinary English five-barred gate, are now used.

The doors open inwards and, before a drive commences, the door, through which the herd must enter, is opened and kept in position by a long rope, leading to a machan concealed in some convenient tree outside the stockade. A slash with a knife cuts the rope and releases the gate which, apart from having been hung so as to swing-to of its own accord, has its pace accelerated by means of a spring, consisting of a rope tied to the top of a bent over sapling, which tends to straighten itself as soon as the watcher in the machan has released the gate.

The old fashioned stockade consisted of stout posts, 18 or 19 feet long, sunk in the ground to a depth of 5 feet with a spacing of about 3 feet, and horizontal logs were packed in between to a height of 13 or 14 feet, but such massive structures have proved unnecessary and involve very heavy labour as the timber must be carried from some distance away in order not to disturb the forest close by.

Nowadays vertical posts, 17 or 18 feet long, are buried 5 feet in the ground, about 5 feet apart, and 3 rows of horizontal beams are tied on outside, one row near the ground level, one at breast height, and the third near the top : the whole structure is strengthened by struts from the ground to the 3 rows of horizontal beams.

The spaces between the upright posts are filled by vertical poles (3 inches in diameter are sufficient), which merely rest on the ground and are kept in position by being tied to the inside of the 3 rows of beams.

Another method is to bury rather smaller posts every foot, the interstices being filled in with poles.

A well built stockade may look extraordinarily flimsy, but there is plenty of give in it, and it is adequately protected from direct assault by a V shaped ditch, 7 feet wide and 5 feet deep.

It is not customary in Assam to tackle old and big males, which may happen to be caught, because it has been found that the *koonkies* (if any can be found with sufficient courage and strength for the job) may be severely damaged in the encounter, and also because mature males often lose heart and practically refuse to live in captivity, so it is not necessary to build stockades strong enough to retain the biggest elephants.

It so happens that the masters of a herd seldom get caught, except when in *musth* because they selfishly try to break away, when danger arises, and the beaters are only too thankful to let them through, but these *goondas*, as rogues are called, are not really very troublesome so long as they are caught with a herd ; they have to be shot, not from fear that they would break out, but because they damage smaller members of the herd, and are, as has been explained, of doubtful commercial value.

Solitary rogues often wander into stockades at night, and occasionally the watcher in the gate-machan makes a mistake in the dark and underestimating the size and age of the elephant closes the door : then the fun begins. Determination on the part of the men may suffice to keep a *mukhana* in, but a tusker seeing red, is an awesome beast, and can generally walk right through a stockade at any spot he likes, despite the ditch, or, and more commonly, he just puts his tusks under the door and heaves it over his back.

V-shaped funnels or wings extend out from the gate posts so that all elephants, which are taking a course parallel to the path, may be directed to the entrance.

The final act of preparation (excluding religious observances) consists of camouflaging the stockade. Living tree-ferns and orchids are fastened onto the doors and door-posts, and branches of trees are stuck in the ground to conceal the funnel.

Care is taken during the work of construction to preserve intact the jungle growing in the middle of the enclosure, and branches and creepers are hung over the sides of the stockade to mask an otherwise too distinctive outline.

The ditch is effectively hidden by fresh branches placed across higgledy-piggledy.

A super-camouflager will sometimes take the trouble to fashion little tracks through the jungle in the middle, the idea being that the elephants, which enter first, will waste time following these tracks, and so enable the men to hustle in the laggards.

One of the outstanding advantages of the present day stockade is that the elephants can see through it. Very few herd animals are game enough to try and rush the ditch and palisade in the face of a man, armed with torch and spear while at night, when the elephants are more restive, the encircling fires are visible and command respect.

The weak point is the gate, a moveable structure without any part buried in the ground and with no protecting ditch and the obvious place of attack, because it bars the exit along the well known path. However, the dear old elephant is not very worldly wise, and it is found that the gate can be made to appear to the elephants to be the strongest part of the whole contraption by merely fitting it with sticks and branches, so that the beasts cannot see through it.

Driving is best done late in the afternoon and evening, when the elephants are on the move themselves, and the beaters like to time their drives so that the elephants are entrapped just before dark, when deficiencies in the concealment of the stockade may not be noticed.

Elephants like to rest in thick cover during the heat of the day, and are inclined to be pig-headed and to circle round if driven while the sun is still high ; after dark they become much more aggressive and may effectively resist pursuit.

A drive may be a lengthy business extending over several days and nights but in that case the earlier stages, while the herd is still far from the stockade, consist merely in the men keeping a long way behind the elephants, so that they will move quietly in the desired direction without stampeding, any attempts to take divergent paths being frustrated by men sent forward to block the way.

The real excitement begins about 3 o'clock on the last afternoon, when pressure is first put upon the elephants.

The beaters as a rule number from 7 to 12, save in exceptional circumstances crowds of men and excessive noise are regarded as the signs of unskilful work.

The beaters are divided into two parties, which follow on either flank of the herd, the men keeping in single file, a formation which permits them to get through the undergrowth without straggling, and to form line if the elephants stand up to them.

The principal difficulties are caused by *goondas* trying to break out of the drive and by mothers of weary calves.

No impediment is offered to the flight of a *goonda* unless some of the smaller fry are following him, when it becomes necessary either to force back the *goonda* or to nip in behind him and head back the others, a very delicate task.

Mothers will charge back time and time again in order to let their calves get on, and they frequently spoil drives by holding back the beaters so much that the leading elephants, with no one behind to hustle them, can discover the approaches to the stockade; they will then leave the path and, if the ground permits, make a big circuit at their leisure round the stockade, all the succeeding elephants following in the footsteps of the leaders, as they know they would never have branched off like this without some very good reason.

Herds will sometimes absolutely refuse to be driven any further, and one is tempted to believe that in these cases the herd must have passed through the unfinished enclosure at night during the time when it was in course of erection, or been made wise in some other way.

Guns are only fired in the last resort and when elephants are deliberately heading in the wrong direction ; the sound of a gun is so terrifying that the herd may panic and scatter pell-mell through the forest, completely beyond further control. Not even guns, however, will stop a herd that has made up its mind to break back, and the beaters are only saved from extermination by their uncanny power of distinguishing between bluff and the real thing on the elephants' part, and their amazing ability to make themselves scarce at a moment's notice as the elephants thunder through them.

Persistence on the men's part may eventually cause the elephants' determination to evaporate, if they keep on getting round in front of the herd, and the elephants will then allow themselves to be driven all the way back.

The diverging paths near the stockade are blocked by men in machans, these stops descending and joining in the passing hunt, when their work is done, and there are also stops at the ends of the wings in case the elephants come along very wide of the real path.

Once the herd has entered the funnel, a gun is fired and every one behind the elephants proceeds to make all the noise he can. The sudden irruption of sound stampedes the animals but escape should not be possible if the men running along outside the wings resist any attempt at a break through. It is not always possible to impound all the members of a herd which straggles into the stockade in extended order, because the elephants, which first enter, sooner or later realize the position and try to retreat. It is amazing, however, that they should take as long as they do to appreciate the situation: the elephants bustle in at the door and hurry across to the far side of the stockade, but the sight of the ditch with the palisade beyond seems to bemuse them, and it is only after some moments' contemplation that they slowly turn and begin to wander back.

The door must be shut, whatever elephants there may still be outside, before the animals inside make a rush for the exit. The writer has seen elephants which had been excluded because the gate could no longer be kept open, barge the gate open, before it had been tied, and join their companions within, but as a rule the excluded elephants make a mad rush for one of the wings and burst their way through.

There is a certain amount of danger to the beaters from these escaping elephants, but it is quite certain that no elephant would in such circumstances waste time in hunting a man if it could possibly get away past him.

Methods of greater finesse must be employed to catch elephants in stockades built near salt-licks.

The herds visit the salt-licks during the night-time only and at irregular intervals, so it is necessary for the men always to be on watch from the late afternoon until dawn.

Two men are stationed in the gate-machan, and the rest are distributed in high machans in the forest on the far side of the lick in such a manner that the elephants can pass by their accustomed paths without getting any scent of man.

As soon as the elephants have reached the lick and are busy taking their medicine, the beaters descend from the machans and hasten to their appointed stations by specially cut paths which are kept scrupulously cleanand free from leaves.

When sufficient time has elapsed for all to reach their stations, torches are suddenly lit and the elephants driven towards the stockade: it sometimes happens that they simply rush straight into it, but more often they are less obliging, and skill and bravery are required to prevent them from escaping along any of the numerous game trails, which radiate from the lick. It is a matter of the greatest difficulty for anyone not accustomed to night work to appreciate what is happening, but a correct diagnosis of all the different crashes in the jungle must be made by the men, as it may be necessary to let small batches go rather than run the risk of frightening back the main portion of the herd.

The noise alone is sufficient to terrify the ordinary mortal and the close proximity of the big beasts is very alarming, but accidents seldom occur so long as the men use their torches boldly.

The salt-licks are very frequently visited by solitary rogues, and it is found that these are often the advance guard of a herd. There is always the chance of a herd coming early in the morning, if a *goonda* has been at the lick the previous evening, or of the herd coming the next evening after an early morning visit by a *goonda*.

It may be presumed from this that elephants pursue an ordered routine when undisturbed, and that a herd will follow the regular round of drinking at the accustomed places, feeding at the accustomed places and lying up in the usual retreats once it has started on one of its regular routes.

The *goondas* are, of course, not molested while at a lick, but a whiff of human smell will occasionally set a *goonda* off squealing in anger and charging aimlessly about.

The men's machans have to be built in big trees as a suspicious elephant will prospect the locality carefully, and may be bold enough to try and tear down the machans.

The writer remembers how on one splendid moonlight night a large tusker crept up noiselessly beneath his machan and stood there puzzling as to the source of this poisoning of the night air ; at last his trunk reached the ladder and told him that a man had gone up it not so very long before. The ladder was soon made into mince-meat, but the tree stood firm and the huge beast rolled off in a very grumpy frame of mind. The next obstacle, which he encountered, was the outside of the stockade, which provided him with a little healthy exercise, and finally he played spillikins with one of the wings before wandering off in high dudgeon. The amazing part of the story is that the two-gate men slept through the whole performance, and were greatly astonished when dawn arrived and they saw the destruction all around them.

At one lick, which we stockaded, there dwelt a very old and evil-tempered *mukhana*, which soon came to learn all about the sites of the various machans, so provokingly out of his reach : one night, abandoning his accustomed path, he entered the stockade unwittingly and, being short-sighted, tumbled, into the ditch on the far side. This thoroughly frightened him and he essayed to retreat at his best speed, but again his sight failed him and he tumbled into the ditch by the door.

This episode was too much for his nerves and we never saw him afterwards.

Elephants will certainly do quite unaccountable things at times ; a *goonda* that walked into a stockade one night, bit the cane, which was holding the gate open, and consequently imprisoned himself inside the stockade, and he had to do a lot of damage before he could punch a hole big enough to allow himself to escape through the palisade.

Elephants very seldom break out of a stockade, and when they do it is generally due to the presence of a big tusker, which unmindful of the spears and firebrands succeeds in bursting his way through and escaping with all his herd.

It is quite clear that the elephants would have no difficulty in getting out, if only they had the sense to rush pell-mell at the stockade and use their weight against it, but that is not their way. They are exceedingly timid animals, and spend most of their time in the stockade huddled up in the centre, scrimmaging round and round, each trying to secure an inside berth. The scrimmages are painful to watch because one fears for the small beasts, but these remain safely beneath their mothers and seldom come to harm.

As an illustration of how timid elephants are may be quoted the story of a herd, which was nearly reduced to panic by the entry of two very small fowls into the stockade. The religious ceremonies, which are performed on the completion of a stockade, include the releasing of two fowls, which from motives of economy are usually quite small chickens. These chickens exist in the neighbourhood of the stockade until some wild cat comes along and carries them off. On one occasion the diminutive pair sauntered into the stockade through some gap, looking for food amongst the debris on the ground, and threw the small elephants of the herd into the wildest confusion until angry charges from the bigger animals expelled them from the enclosure.

Single elephants will continually charge out from the scrum in the middle, but their charges end in precisely the same way as do the rushes which a dog will make at a cat ; the brakes are put on before the ditch is reached, and after a few kicks into space with the fore-feet the elephant retires.

Elephants are more restless at night, but a shout from a man and a wave of a torch are generally sufficient to maintain discipline.

Different countries have different methods for getting the wild elephants out, in Chittagong, for example, the *koonkies* enter the stockade backwards, the *phandis* being armed with long spears to keep off any inquisitive wild elephant that comes too close with evil intent. Men descend from the *koonkies* and operating beneath them dexterously manage to bind the legs of the wild elephants, which can then be taken out very easily.

More direct and spectacular methods are employed in Assam, the *koonkies* entering head first and dragging out the reluctant wild elephants without any preliminary hobbling.

The *koonkies* are arranged in single file with the biggest animal, preferably a tusker, in front. The wild elephants smell the *koonkies* from afar, and the first intimation of the *koonkies'* approach is conveyed to those watching the stockade by the up-lifted trunks and visible uneasiness of the herd. The elephants generally retreat towards the far side of the stockade and their attention is distracted there by fodder being thrown to them.

The bands tying the gate are loosed and, while men pull on ropes, the leading *koonkie* butts the gate open and stalks in with the remaining *koonkies* crowding after it.

It is advisable that the gate should be opened with reasonable speed. The writer has seen a big female charge at a gate, which stuck after being opened a little way, and she banged it shut with such force in the face of the *koonkie* on the other side that his morale was seriously effected.

It is still more advisable that the gate should shut quickly after the last *koonkie* has entered. On one occasion the leading *koonkie* swung the gate open so violently as to unhinge it and prevent it from being closed. In the subsequent confusion the men lost their heads and the *koonkies* were seized with panic, although there were only a few small females to deal with, and the whole mob, wild and tame, barged out through the open door amidst the groans and tears of the stockade men.

The wild elephants never combine to overwhelm the *koonkies ;* one or two of the bigger beasts may look a little aggressive, but the *koonkies* go straight up to them and start hustling the herd round and round with the same confidence as a few disciplined men will show when dealing with an unruly but leaderless mob. No great violence is necessary and there is no excuse for damaging the wild elephants.

It used to be the custom in Assam to delay putting the *koonkies* in until the wild elephants had been weakened by thirst and hunger, but such cruelty is entirely unnecessary and has been discouraged by Government fixing a limit of time, within which the stockade must be cleared, or else the catch set free.

After five minutes or so the animals are allowed to settle down, and the men untie their nooses and get to work. The noosing is often a tiresome job, especially in the case of small elephants, which will insist upon running under their mothers ; this makes it difficult to shorten the rope and tie the noose properly to prevent it getting any tighter and unless this is done there is always the danger of strangling.

It is necessary for the *koonkies* to kneel down when the noose on a very small elephant is being tied, as otherwise the man cannot reach it.

An elephant may require one, two or even three *koonkies* to manage it ; in the latter case the third noose is generally tied to a hind leg and is very effective in checking too headlong a progress.

The noosed animals resent being detached from their companions and have to be hauled to the door and there is a danger, when the *koonkies* have not sufficed to noose the whole catch, of the un-noosed elephants following the procession out, so that the biggest *koonkie* is detailed to act as rear-guard, and he turns round and looks very fierce if the rest of the herd show signs of following.

Once outside the door (and the getting outside may be a regular case of pull devil, pull baker), the pace quickens up, and the *koonkies* have to use all their strength to prevent their captives from pulling them off the track into the forest. The passage from the stockade to the camp is usually rather a rough one for all concerned.

The new elephants are tied up for the first night by the hind legs to one tree and by a long rope from the neck to another tree, and as high up on it as possible, to prevent the elephants from catching the rope and biting through it. It is necessary to have a *koonkie* on each side, when the hind legs are being fastened, in order to obscure the elephant's view and prevent its frantic kicks from being properly aimed.

An elephant tied in this way can throw itself on the ground and exert all its weight in trying to break the ropes on the hind legs, and it is hihgly desirable that it should thus tire itself out as much as possible, because in the succeeding marches to the training camp the *koonkies* have to carry the men's kit, as well as lead the captives, and if the *koonkies* are few, one *koonkie* may have to take two wild elephants.

A barbaric device to keep big elephants quiet on the march was to cut the back of the neck with a knife so that the noose could be fastened into the wound and discourage struggling by the pain. Government is now taking every precaution to discourage this sort of treatment. It is not difficult to detect a neck that has been deliberately cut, but the *phahdis* can obtain much the same result by sprinkling damp sand under the noose, which quickly eats through the skin in a more natural looking manner. The Black List now awaits the men, who cannot bring their elephants in without a clean neck.

Tying the hind legs takes considerable time, so after the first night it is customary to fasten the elephants short by the neck to a tree in such a way that they can run round and round the tree, from which the bark has been removed in order to facilitate the rope slipping round without fraying.

The training is the next episode in the elephant's career on its road to a life of domesticity and usefulness.

Keeping an elephant tied up tight by the head, and spearing it for every misdemeanour has hitherto been considered the correct way to train an elephant, but the writer has been conducting experiments, first on a small and then on a very extensive scale, for the last five years, and has been able to prove that a more rational method of treatment yields better results in every way.

In the first place the training casualties, which have been known to be as high as 48 per cent., have been reduced to less than 1 per cent., and in the second place it has been found that elephants, which are decently treated, settle down to their work in an incredibly short space of time, and are more easily and effectively trained than those which have been maltreated and have had their spirits broken.

The elephants, of course, seek every opportunity during the first few days of their captivity to attack any human being who goes near them, but their lack of success, coupled with the heartiness with which the retaliatory stick is laid on, soon convinces them of the futility of their attempts, and their desire for a quiet and inoffensive life asserts itself so strongly that they abandon further resistance.

The stick they have to get sometimes, and it is adequate punishment for these kindly beasts, though it cannot possibly hurt their thick skins.

The use of the spear is to be deprecated, not only because the wounds inflicted may set up septicaemia, but also because the fear of the pain distracts the elephant and prevents it concentrating its mind on its task and so delays the completion of its education.

An elephant has to be tied up fore and aft by its legs in the training depot, except when taken out for training ; it is unnecessary to tie it up tight by the head (save during the evening performance), and it is dangerous to do so, as it may develop a bad neck wound, leading eventually to its death. Rope-harness is attached to the elephant for the benefit of the man, who has to mount it.

The " evening performance " is a great show.

Eight or ten men approach the elephant after dark, and after its neck has been tied closely to a post, a man seizes its tail and the mahout springs on to its back.

One man in front waves a torch in its face, and the others surround it, keeping well away from reach of the trunk, and proceed to scrub it with wisps of grass, and all to the accompaniment of appropriate songs.

The frightened animal bellows, shakes, throws itself on to the ground, lunges at everyone with its trunk and tries to catch the irritating torch, but all in vain, it is well lambasted with sticks and the torch proves itself to be a beastly hot thing to catch hold of.

This treatment is continued for a week or so until the elephant makes no resistance, and the men can rub its face without being attacked.

The actual training takes place morning and evening.

The elephant is taken out between two *koonkies,* to which it is attached by very short nooses.

The mahout is already on one of the *koonkies* and leaps on to the new elephant when all is ready. The animal may shake a little, in which case the mahout must hold on very tight, while the mahouts on the *koonkies* hit the elephant over the head, and the men on the ground in front and behind beat it with sticks. Shaking is a most dangerous vice and has to be stopped at all costs, and it is lucky that very few elephants take to it.

It must be remembered that an elephant has generally lost a good deal of its pep by this time. It has been through a rough and tumble in the stockade, may have had several days' march with inadequate food, has been tied on the stretch by all four legs (to prevent it getting a real good rest), and has experienced the terrifying performance at night, so, take it all round, the poor beast cannot be in its best shaking form.

The man on the ground in front is a source of much irritation to the new elephant, but it cannot get at him and he can safely prod its trunk with his stick or bamboo, while the mahout hammers it, whenever it tries to rush forward.

The man behind, who sings the whole time in a horribly strident tone, is safe from being kicked because the action of the hind legs is limited by ropes, but he punishes all attempts at kicking, and the elephant has to learn to tolerate him.

When the mahout feels securely fixed, the order to proceed is shouted out, the *koonkies* go forward and the elephant gets a prod behind each ear from a sharpened bamboo.

The order to stop is shouted, the *koonkies* stop, and the mahout leans forward and catches his beast a good clout between the eyes.

The order to go back is followed by the mahout digging the point into the elephant's forehead and pulling, while the two *koonkies* pull the captive back a few steps.

A full-grown female requires two *koonkies* for 4 or 5 days, after that one *koonkie* drops behind and, if the elephant behaves, goes about its business. The remaining *koonkie* will be needed for another 4 days, but after that a man on the ground with a leading rope will suffice until the animal can be taken out by its rider in the company of other old and new elephants.

Progress has meanwhile been made in the depot; the elephant will allow itself to be tied up without attempting to kick, and it will feed nicely from the hand.

An elephant should be ready for removal to the purchaser's home from within 14 to 21 days after the commencement of training, according to its size, though they are still far from being trained.

A full grown female should begin bringing in a few stalks of fodder after a fortnight and after 4 or 5 weeks should be fit for loading with almost a full feed.

Elephants are easiest taught to kneel down by being stretched out fore and aft, and then prodded behind the withers with a sharp bamboo, while the word of command is shouted, and men haul on the front leg ropes till the elephant has to sink down to the ground.

Runaway elephants may forget everything else, but never seem to forget how to kneel down.

All the other accomplishments are gradually taught, and the elephant should be safe to shoot from at the end of 5 or 6 months, though still by no means absolutely trustworthy.

REVIEWS.

A Naturalist in Hindustan. By Major R. W. G. Hingston, I.M.S. (London, 1923; H. F. and G. Witherby; pp. XII+292, 10 plates and text-figures; price 16 Shillings nett).

Many of our readers will recollect with pleasure Major Hingston's previous book, *A Naturalist in Himalaya,* in which were recounted the observations made by the author in the Hazara district. In the present book he gives us a collection of varied observations and experiments made in one small patch of jungle in Fyzabad in the United Provinces, which is described in the first chapter. The remainder of the book is devoted to the habits and instincts of Ants (six chapters), Spiders (four chapters) and Dung Beetles (three chapters), concluding with a chapter on the South-west Monsoon.

Written in a charming style, albeit clear to the point of simplicity, the author presents us with vivid word-pictures of the habits and instincts of the insects and spiders which he has watched and, by well-devised and clearly explained experiments, gives us an excellent insight into the evolution of such subjects as communication amongst ants or the construction of spiders' webs. We feel strongly tempted to make long quotations but considerations of space prevent this; and, where there are so many plums, it becomes difficult to make any adequate selection.

This is just the sort of book to appeal to many of our members who would like to learn a little of the wonderful world which exists around them in everyday life in every station in India and who have been looking for a well-written account in non-technical language. To all such we can strongly recommend *A Naturalist in Hindustan* as just the thing they have been waiting for.

A Biology of the British Hemiptera-Heteroptera. By E. A Butler (London, 1923; Witherby and Co.; pp. viii+682, with coloured plates, photographs and text-figures; price £3-3-0 nett).

This book gives an up-to-date account of all that is known regarding the early stages, habits, food, life-cycle, and occurrence of all the species of Hemiptera (as opposed to Homoptera) which are known to occur in Great Britain. The Indian student of this important Order of Insects may at first suppose that little of interest to him is contained in this volume, but this is far from being the case. The general notes on the various groups are of universal interest to entomologists in all parts of the world and, so far as the student of the Indian Fauna is concerned, this book includes descriptions of the following species which are definitely noted as occurring in India, *viz:*—(Pentatomidæ) *Eurygaster maura, Carpocoris fuscispina, Dolycoris baccarum, Eurydema dominulus, Troilus luridus, Zicrona cærulae;* (Coreidæ) *Therapha hyoscyami;* (Lygæidæ) *Lygæus equestris;* (Pyrrhocoridæ) *Pyrrhocoris apterus;* (Anthocoridæ) *Lyctocoris campestris;* (Capsidæ) *Miris calcaratus;* (Notonectidæ) *Notonecta glanca, N. furcata, N. maculata;* (Corixidæ) *Corixa geoffroyi* and *C. hieroglyphica.* In addition to the above, about thirty other species are so widely distributed in the Palæarctic Region that they may reasonably be expected to occur in the Northern parts of the Indian Empire also.

The book is well-written and well produced and will prove indispensable to all serious workers on the Hemiptera.

Manual of Entomology By H. Maxwell Lefroy. (London, Edward Arnold and Co., 1923; pp. i-xiv+541; 35 Shillings nett in the United Kingdom).

It is very difficult for any author to keep in proper perspective the entire field of investigations in a branch of science like that of entomology with due reference to varying degrees of keenness of different workers in different and quite divergent directions, yet such an attempt has been successfully made by Prof. Lefroy in the work under review. The book is not a complete treatise dealing with all aspects of entomology, for such a work, as the author himself rightly says, " would occupy many years and fill many volumes." On the other hand it is based on lectures delivered by the author in the second year of a three years' course in the Imperial College of Science and Technology in London. No attempt is made to discuss details, but the essential points about the different groups of insects are all fully dealt with. Details of structure and morphology are sacrificed in favour of notes on habits, enemies and checks of various insect pests. The latest classification of the insects is adopted, and for the sake of comparison the schemes given in Sharp's volumes on insects in the *Cambridge Natural History* and in Sedgwick's *Textbook of Zoology* are given in parallel columns. Generic and specific lists are avoided except in very important cases like that of the silkworms. Regarding nomenclature the author has done well to follow the middle course " between the ultra-conservative and the ultra-nomenclaturist"—two very happy selections of names for the present day exponents of the two Schools of Zoological Nomenclature.

The illustrations are reduced to the minimum as the author does not believe in the identification of insects from drawings or pictures, and lays greater stress on the examination of living and pinned collections. The text-figures are, however, quite numerous, clear and in every way worthy of a textbook. In addition there are four half-tone full-page plates, but these are neither very characteristic nor is the reproduction very satisfactory.

In the matter of literature citing we cannot agree with the author. He assumes that every student of entomology is familiar with the use of the *Zoological Record*, *Genera Insectorum* and the *Review of Applied Entomology*, and therefore reduces most of his references to the name of the author and the year of publication of the work, as for example "*MacLachlan* (1868)." This course may be defended on the basis of economy of space, but surely the work would not have increased in bulk to any great extent if the name of the serial in which the work referred to was published had also been given. This has been done in some cases, and we only deplore that the method was not generally adopted. In short the methods of citation of the literature, owing to their inconsistency, are not to be commended.

The book seems remarkably free from misprints, but looking through casually we have noticed an unfortunate *lapsus calami* in "Die Kriegelmücken" on p. 428 for " Die Kriebelmücken."

The absence of synoptic keys for the various orders and families is a great drawback, and a chapter in the beginning of the work dealing with the external structure of a typical form as also the larval and pupal stages would have been very useful. A glossary of descriptive terms would also have added to the usefulness of the work.

The very high price of the work is somewhat prohibitive and will, we are afraid, greatly discount the value of the book.

The work is primarily intended for the British student, and the literature references are, therefore, mainly restricted to those on British insects, but the book should prove of great value to students of entomology all over the world.

B. PRASHAD.

INDIAN EARTHWORMS: The Fauna of British India including Burma and Ceylon (Oligochæta) By J. Stephenson, M. B., D. SC., Lieut.-Col., I.M.S. (retired), Lecturer in Zoology, Edinburgh University.

The earthworms are not a popular group among naturalists. Their study involves great practical difficulties if it be biological, and careful dissection if not section-cutting, if it be anatomical or systematic. Nevertheless they are of great practical moment in agriculture, while in zoogeography they are among the most important groups of animals. In the history of scientific zoology in India, moreover, they have played a great part. This was due in the first place to Dr. (now Sir Alfred) Bourne, late Director of Public Instruction and formerly professor in the Presidency College, Madras; but the foundation of a regular school of oligochætology (if one may be permitted to coin a word) was instituted much more recently in Lahore by Lieut.-Col. J. Stephenson, I.M.S., the author of the book under review. In addition to the early contributions to this branch of zoology by Sir Alfred Bourne, several important papers have been published by Dr. W. Michælsen of Hamburg and others, but it is to Col. Stephenson and his pupils that we owe the greater portion of the work now summarized.

Two things seem to me of the first importance in the preparation of volumes in a series like our " Fauna "—a knowledge of the group discussed and a knowledge of the country under consideration. In some cases, when the author has exceptional capacity, the latter may be dispensed with, as in Dr. Boulenger's account of the reptiles and batrachians; but many of the recent volumes in this series have suffered from the fact that their author was a museum specialist without knowledge of India though he may have lived in the country. No such reproach can be brought against Col. Stephenson, who has studied the Oligochæta of the Indian Empire for fourteen years in India. There is one point, an innovation in the fauna, in which he evinces his appreciation of the geography of the country particularly, *viz.*, the inclusion of maps illustrating the range of different genera.

The introductory part of the volume is of the greatest interest to all naturalists, even if they do not wish to study the highly technical descriptive part. Geography, bionomics and the methods of examination and determination are discussed in a clear and at the same time an admirably concise style. It is to the two former sections that I propose to direct my remarks.

Bionomics.—In spite of Darwin's classical work on the British earthworms, very little is known in detail about the natural history of the group as a whole. All that Col. Stephenson can find to say about that of the Indian forms is comprised in three and a half pages, and the greater part of what he says refers to the small aquatic species which are not, strictly speaking, earthworms at all. These species, as he points out, are fascinating to the microscopist, being for the most part minute and transparent with most of their internal anatomy displayed almost like a diagram under magnification. In Indian waters at any rate many of them are associated frequently if not habitually with sponges and polyzoa, while those of the genus *Chætogaster* are definitely symbiotic with or parasitic in either sponges or freshwater snails. Another little species (*Aulophorus tonkinensis*) builds for itself a portable abode which is often composed of the seed-like reproductive bodies of sponges and polyzoa. The methods by which some of these aquatic forms obtain oxygen for respiration are remarkable, and Col. Stephenson has given full references to literature on the subject.

Among the true earthworms differences of habitat are greater than is usually recognized. Some are found habitually in rotten wood, others in the small accumulations of earth or debris at the base of the leaf-stems of palm-trees and plantains. Some genera and families find excessive moisture more necessary than others, and some have assumed a completely aquatic life with little or no structural modification.

The only instance that Col. Stephenson can give of an Oligochæte worm of direct commercial importance is that of a small aquatic species which is sold as food for goldfish in Japan. It is said to be particularly good for the complexion of the fish.

Geography.—Col. Stephenson describes fully some 330 species. Of these about 40 are minute aquatic species of little or no geographical significance, the genera, and in some cases even the species, being cosmopolitan. Except in Lahore and in Calcutta, moreover, these little animals have been very little collected. The littoral species, found at the edge of the sea, are few in number and equally unimportant from a geographical point of view.

Col. Stephenson divides India, Burma and Ceylon into nine "regions" (it would have been better to call them districts or areas) as follows:—

1. North-Western Territory ..	The drainage of the Indus (plains); the Punjab, N. W. F. Frontier Province, N. Rajputana and Sind.
2. Western Himalayan Region ..	Himalayas from Hazara to Nepal, including Kashmir.
3. North-Eastern Frontier Region.	Himalayas from Nepal eastwards and Assam.
4. Indo-Gangetic Plain	United Provinces, Behar and Bengal (plains.)
5. Burma	Burma, the Andamans and Nicobars.
6. Main Peninsular Area.. ..	Peninsular India E. of the W. Ghats, S. of the Indo-Gangetic Plain and N. of lat. 15°, with S. Rajputana and the Central Indian Agency.
7. Southern Region	The Peninsula S. of lat. 15°.
8. The Western Region	Goa, the W. Ghats and thence to the sea.
9. Ceylon.	

A defect (which this volume shares with all others in the series) is the absence of a detailed map of the Indian Empire and Ceylon showing the limits of these areas graphically.

The distribution of many of the genera, as is clear from a comparison of Col. Stephenson's outline maps of the genera with the charts in Eliot's *Climatological Atlas of India,* is closely correlated with that of excessive rainfall, but this of course has not been the only factor in determining the range of different forms. A considerable number of species are "peregrine," that is to say wanderers. The word has been used in two senses, to indicate species that have been carried about by man with cultivated plants, etc., and those that have spread themselves abroad naturally with the aid of birds, frogs and other animals to the feet of which either the worms themselves or their cocoons have accidentally adhered, or in floating logs or other flotsam. It is the true endemic species, the genera of which are confined (except for forms of peculiar vigour and of wandering tendencies) to limited areas, that provide valuable date for the study of zoogeography. These seem to indicate in India that the fauna has been recruited largely from areas of heavy rainfall to the east or north of the Bay of Bengal. Other forms, however, have come from the south-west and are probably of Ethiopian origin. A few genera seem to have been evolved in the Indian Peninsula.

Considering Col. Stephenson's work as a whole we may accept it as worthy of the best (and older) traditions of the Fauna—no mere compilation, though amply provided with references to literature—but the result of many years' solid work in the field and with the microscope and the dissecting case as well as in the museum and the library. It cannot fail to become and remain a standard book of reference.

N. ANNANDALE.

A Survey of the Fauna of Iraq.—Mammals, Birds, Reptiles, etc.—Made by embers of the Mesopotamia Expeditionary Force 'D' 1915-19. (Bombay Natural History Society, pp. XX+404, with coloured plate, photographs, maps and text-figures. *Price Rs.* 7-8-0).

The following Review under the heading "Progress of Science—War Collections from Iraq" appeared in the London *Times* of the 27th November. The reviewer being the scientific correspondent of the *Times,* we publish it in full for the benefit of members who have not yet obtained copies. These are obtainable in England from Messrs. Dulau & Co., Ltd., Margaret Street, Cavendish Square, London, W., and in India from the Society's Office.

" Fortunate were those persons who could relieve the vast tedium of a modern campaign by observations on natural history. Many soldiers who had little knowledge of the ways of wild creatures were amazed at the fashion in which birds and beasts pursued the routine of their lives amidst the thunders of war, sometimes even finding between the trenches less disturbance from man than in cultivated fields. But military duty called many naturalists from the museum to the field, and, in addition to random observations, much serious collecting was done. In the course of the Mesopotamian campaign, the Bombay Natural History Society got into touch with all those who were likely to collect mammals or birds, reptiles or insects while they were on active service, and arranged to take over the specimens and to have them examined and catalogued in Bombay or in London and reported on in the Society's journal.

The work so carried out has made a substantial contribution to knowledge of the fauna of Mesopotamia and has been brought together in a single volume, under the title " A Survey of the Fauna of Iraq," published under the auspices of the Natural History Society at Bombay. In 1915, Captain N. B. Kinnear, then of the Bombay Museum and now of the British Museum (Natural History), wrote a little pamphlet for the use of members of the Expeditionary Force, showing how little was known of the fauna of the region in which the campaign was to take place, and so advised soldier-naturalists of the excellent work that they might possibly undertake. As a result, no less than 92 species new to science were discovered and are described in this volume, and in addition the known range of a much larger number of creatures has been extended, and a large fund of information as to habits has been gained. Specimens and duplicates have been deposited in the British Museum (Natural History), where all the material was sent at the end of hostilities, in the Bombay Museum, and in various well-known institutions.

COLLECTING IN THE FIELD.

Many of the specimens were caught and even skinned close to the enemy's lines and under range of his guns. Colonel Magrath for example caught and skinned a lesser shrew—an animal not two inches long—under shell-fire in the trenches in front of Kut. Captain Pitman, in charge of the Regimental Scouts, trained his men to look out for specimens, as well as for the enemy. Sir Percy Cox, especially in the earlier part of the campaign, sent many living creatures, including five giant herons, to the Victoria Gardens at Bombay, and, although the end of the war did not lighten his responsibilities, continued, in association with Captain Cheesman, to collect and to send to London and India living and prepared specimens. Colonel Wall, of the Indian Medical Service, an authority on snakes, as soon as he arrived, covered the palmtrees at Basra with posters advertising rewards for snakes sent in to him. Dr. Buxton, Captain Ingoldsby, and many other soldier-naturalists of repute helped in the work.

Mesopotamia is an alluvial plain, about 450 miles long by 150 wide, watered by the Euphrates, Tigris, and Karun, and lying between the Syrian and Arabian deserts on the west, and the foothills of the Persian and Kurdistan mountains on the east. The country on the right bank of the Euphrates is actual desert, and here were found hyænas, and pale desert foxes, jerboas and gerbils, cream-coloured coursers and spotted sandgrouse, ostriches and partridge.

JUNGLE LIFE.

In the bends of the rivers there is thick jungle and the marshes give a safe home for innumerable water-birds including pelicans and giant herons. Captain Cheesman came to the conclusion that the legends of ancient Mesopotamian forests were mythical, and does not believe that the Kings of Egypt came to Mesopotamia to hunt elephants, unless these and their keepers had come together from more distant lands. As huge canals were built there 4,000 years ago, it seems probable that even then the country required irrigation. In any event, there is now only low cover, which harbours wild pig of a kind that was not identified, but had striped young, and seemed larger than the Indian pig, too brown for the European wild boar. But there are wild cat, probably caracals, hares and jackals. On the higher ground gazelles are abundant, porcupines were frequently found and examples of a new species of ratel discovered.

The most interesting character of the birds of Mesopotamia, on which full information was obtained, was the relatively small number of permanent residents, as compared with the long list of migrants and winter visitors. In some places the only permanent resident was the crested lark, but during the spring and autumn migrations even the most desolate spots were thronged with birds, staying a while to rest, or merely passing over. The river valleys appear to be part of an immemorial route of birds passing between Europe and Asia and Africa. In consequence, probably, of this unsettled feature of the bird life, the collections yielded almost nothing in the way of new species. The invertebrates, on the other hand, seem to have been little studied before, and crustaceans, butterflies, sawflies and orthopterans supplied a large proportion of forms new to science."

EDITORIAL.

One of the changes recently made in the Journal was the placing just before the Miscellaneous Notes of comments by readers on what had appeared in previous numbers. When the Editors, however, have to draw attention to a mistake made by themselves they should surely clothe themselves in sackcloth and ashes and confess their fault in their own editorial, especially when their fault was that of giving wrong information about a distinguished and honoured visitor to India. The author of the account of H. R. H. the Prince of Wales' Shooting Tour in India, when writing about the Gwalior Shoots, mentions in a footnote (see Vol. XXIX, page 193) that Monsieur Clemenceau, when shooting at a tiger, had the misfortune to shoot a buffalo that had been sent into the jungle to locate a tiger which refused to move and that as the tiger attacked the buffalo, in the rough and tumble which ensued, Monsieur Clemenceau shot the buffalo. H. H. The Maharaja Scindia, who has been a member of our Society for many years, noticed this statement and at once wrote to ask us to publish the correct version as it was he himself and not Monsieur Clemenceau that by mistake wounded the buffalo. He writes: "What happened was this, that the tiger broke through the buffaloes and got mixed with them; I aimed at the tiger but missed the tiger and hit a buffalo; and for that reason I had to fine myself heavily by compensating the owner of that buffalo." His Highness' desire to have the matter put right is what one would expect from such a good sportsman as he is, and we hope that Monsieur Clemenceau will accept our apologies for permitting an impression to appear in our Journal that he had ever failed to obtain what he had intended to get, or that he was not as successful in his shooting in India as he had been when directing France in her great battle for freedom

In the last editorial we referred to the Society's publications. These have been causing the Committee some perturbation. A scientific publication such as the Snake Chart prepared by Mr. Prater on Col. Wall's book has sold well so far as the big charts for Hospitals and Dispensaries are concerned, and the small pocket charts are becoming more in demand, but what one would have thought would have been the desire of all small game shikaries in India—the sumptuous volumes of Stuart Baker's "Game Birds of India"—attract little attention and the lack of demand prevents any thought of bringing out another volume, although eagerly awaited by those who have bought the first two volumes. This Journal will be in the hands of members about Christmas or New Year time. Will they think, when thinking of what their friends want for X'mas presents, of the pleasure all lovers of small game shooting in India obtain from the perusal of Stuart Baker's fine volumes!

We do not mind appealing thus openly to members to act as agents for the Society because they have responded to our appeal to bring the advantages of membership of the Society to the notice of those who are not members. The number of new members who have joined the Society of late has been very encouraging and makes a good set off to the number of those who, by retirement from India, annually thin the ranks of the Society. Naturally we, in the Society's office, cannot understand why retirement from India should necessitate retirement from the Society—surely the very opposite should be the case! Is it not necessary in retirement to keep fresh and to keep in touch with the hobbies of one's youth! Still, hard times and small pensions make it necessary for many to resign but we do wish members would understand that to resign whilst on service in India is—well we wish we could say "It's not done".

But like some Padres who preach to those who attend Church about the iniquity of those who do not go to Church, we are perhaps wasting our space yet may we ask all those who are members to register their determination never to resign so long as they remain in India.

We cannot all remain in India and we have to record our regret that, owing to ill health, Mr. B. C. Ellison, a former joint Editor of the Journal and Curator of the Society's Museum, has had to resign. Mr. Ellison suffered severely from Malaria during his stay in India and his health had evidently been undermined by having been attacked with Typhus in one of the German Prison Camps. He was a man of great enthusiasms and was full of schemes. Had his health permitted of his staying on in India he would, no doubt, have retained his enthusiasm, but under the powerful brake of "No money" applied unmercifully and at all times by a pessimistic Honorary Secretary, he would have given up schemes for the future to grapple with the practical realities of making bricks without straw.

His successor, Mr. S. H. Prater, has to grapple hard from the very beginning with these unpleasant realities and it is well that he has spent a long apprenticeship in the Society under Mr. Kinnear and Mr. Millard who had no visions where finance was concerned and cut the Society's coat in strict accordance with the Society's cloth. Members ought to realise that a brake must be applied to the Society's rake's progress and, to show this is no mere fashion of speech, we give below the Society's ordinary income and expenditure for the past 10 years :—

	Income.		*Expenditure.*		
	Rs.	a.	Rs.	a.	
1914	33,954	7	37,386	1	
1915	30,273	12	25,086	9	
1916	31,762	7	27,024	10	
1917	31,132	7	22,054	15	
1918	34,705	9	22,840	15	
1919	33,151	10	32,308	10	
1920	32,264	15	31,240	4	
1921	64,563	13	54,273	0	
1922	39,787	13	48,531	7	
1923	37,048	5	45,462	8	to date.
	3,68,645	2	3,46,208	15	
Investments ..			22,800	0	
		Rs.	3,69,008	15	

Invested 1914-1923 on account of Life Membership Rs. 22,800.

The increase in 1921 was due to the receipt of a final Government Grant of Rs. 15,000 in that year in full settlement and to the exceptionally large number of Life Members who took advantage at the time of the increase in subscription to become Life Members at the old rate and the receipt from this source was Rs. 14,600. The total amount of Life Membership commutation received in the ten years amounted to Rs. 17,600. Our income from investments (of Rs. 65,800) on behalf of Life Members is Rs. 2,812-14-0. We have 156 Life Members who, if paying the ordinary subscription, would be bringing in a revenue of Rs. 3,900. We ought to have another Rs. 20,000 invested on account of Life Members and perhaps consider whether Rs. 350 is not too low a figure for Life Membership. Anyhow the Life Member is scoring at present and no doubt congratulates himself on his wisdom. Still all this does not disguise the fact that in the two years 1922 and 1923 we spent some Rs. 16,000 more than we received. Retrenchment is the order of the day, but what about an increase in membership and so increased revenue?

In addition to the above the Society realised from the sale of Snake Books, Pamphlet on White Ants, advertisements, sale of Pigeon Book, List of Butterflies, and other sundries, including donations, etc., some Rs. 10,000.

Turning to matters outside the ordinary expenditure, the Society has about recouped itself for the money expended on the Snake Charts, and future sales will mean revenue to the Society, but with the "Game Birds" publication the position is that we have only sold sufficient to repay us what we have already paid out and that we still owe Rs. 16,000 to the publishers. We want to sell 266 copies of Vol. I, and 227 copies of Vol. II, to recover this sum, hence the earnestness of our appeal in an earlier part of this note.

Mr. Prater is, however, more concerned financially with the Prince of Wales' Museum side of the Society's activities. Here he is confronted with a new world to create and no money to pay the builders. What he is effecting and has already effected is something to be proud of, and "if" "if only"—yes—even with him schemes hold the day!

Will our President's appeal to some of our members, an appeal to associate themselves with H. R. H. the Prince of Wales becoming our patron by themselves becoming Vice-Patrons, bring in such a response as to make the Natural History Section of the Prince of Wales' Museum worthy of this Society and of the City of Bombay? "If so", well the answer will be given in the next editorial.

There is one sad thing about the appeal and that is it is the last active interest our President, Sir George Lloyd, has been able to take in the Society's governance. Sir George Lloyd's period of office as President of our Society has witnessed bigger changes than any previous period. We are not speaking of changes in personnel, though Sir George Lloyd's Presidentship has included the retirement of Mr. W. S. Millard and the resignation of his office by Mr. N. B. Kinnear, we refer to the material change in the transfer of our show collections from the old rooms in Apollo Street to the more spacious halls of the Prince of Wales' Museum. We could not have carried on as we were. The loss of the Government Grant and the inability to expand would have spoilt our collections and given us almost a knock out blow. A former President, Lord Lamington, conceived the idea of housing us in new quarters. Sir George Lloyd saw to our moving, and his last act has been to do his best to ensure our filling our new home worthily. We regret very much his departure and hope that he will remain a member of the Society for many years to come.

We are very glad to be able to publish in this Journal the lecture on "Animal Life of the Ganges" delivered by Dr. Annandale, C.I.E., in the Indian Museum, Calcutta, on the afternoon of August 22nd, 1923. We hope Dr. Annandale will give us the pleasure of publishing several other popular papers by him. In the next number of the Journal will appear the first of a series of illustrated articles by Capt. R. S. P. Bates on "Birds' nesting with a camera in India." The whole will be divided into three parts—

(1) The Sindh and Liddar Valleys, Kashmir.
(2) Rampur and the Lolab, Kashmir.
(3) An Indian Heronry.

Capt. Bates' photos of birds' nests and birds are wonderful nature photos and we are confident will make a great appeal to all interested in Bird Life. We feel very fortunate in being able to include him amongst the contributors to the Journal.

Not very long ago Mr. F. J. Mitchell, the pioneer of trout fishing in Kashmir, sent home a collection of flies taken from the trout streams of Kashmir ; some of these were new to science, one specimen in particular attracting considerable attention amongst Entomologists in England (a reference to the collection was made in Vol. XXIX, No. 1, page 305), but we missed the opportunity of communicating that discovery to the scientific world. This time we are to be more fortunate. Another collection has been sent home by Mr. Mitchell, and Mr. Edwards, of the British Museum, who has examined the collection, has promised to describe the collection in an illustrated article on "New Nematocerous Diptera from British India."

We should like to offer our congratulations to Major R. W. G. Hingston, I.M.S., and to Mr. E. O. Shebbeare, both members of our Society, on their being selected members of the Mt. Everest Expedition for 1924, and we hope they will make use of our Journal to record their experiences.

The above editorial was already in the Press when we learnt with deep regret of the death of our oldest Vice-President Mr. J. D. Inverarity. A short obituary notice appears on another page, but we take this opportunity of expressing on behalf of the Committee of the Society their appreciation of the work done for the Society during the early days of its career by Mr. Inverarity,

OBITUARY.

JOHN DUNCAN INVERARITY.

J. D. Inverarity was born in Bombay in 1847; he was the son of Dr. Inverarity; the friend and brother-in-law of Jonathan Duncan, the Governor of Bombay in the last days of the 18th and the early days of the 19th centuries. Educated at Cheltenham, he returned to Bombay in 1869, where by the sheer force of his character and the brilliancy of his intellect he soon established himself as one of the leading lights of the Bombay Bar. He was a great lawyer, and was famed throughout India as such. In the words of the Chief Justice of Bombay, the Bombay High Court prided itself in having as the leader of its Bar, an Advocate, who for 30 years had no equal in India. It is not as a great lawyer; however, that we would speak of John Duncan Inverarity, but as a big game hunter and naturalist. It was in the early days of his career that Mr. Inverarity associated himself with the Bombay Natural History Society. He joined the Society almost at its inception in 1886, became member of its Managing Committee in 1891 and a Life Member in 1893, and was elected its Vice-President on the 6th April 1897 and continued as such till the time of his death. He was a valued and constant contributor to the pages of the Journal. He was a big game hunter of no mean repute and excelled, not only as a shikari, but as a close and accurate observer of the habits and characteristics of the animals he hunted. Being gifted with a facile pen he was able to include his observations in his writings on sport and jungle life. In his "Unscientific Notes on the Tiger", published in Volume III of the Society's Journal and read before the Bombay Natural History Society on the 9th of April 1888, Mr. Inverarity wrote: "One of the chief pleasures of shikaring, to my mind, is the observation of the manners and customs of the animals one pursues. I keep a journal when in the jungle; so I have been able to correct my memory by reference to notes made at the time." Mr. Inverarity's observations on the tiger helped to elucidate many points on the subject of the breeding of tigers, their mode of attack, and the treatment of their kill. Mr. Inverarity also gave the Society the benefit of his observations in regard to the Indian Gaur, more often, though erroneously, spoken of as the Bison. In his article "The Indian Bison, with some notes on stalking him," Mr. Inverarity gives a very accurate description of the appearance of the animal from observations made by him in the field, and his paper also includes valuable hints to the hunter of this animal; his concluding advice being an index to the character of the man, "Find the tracks yourself, track him yourself for miles and kill him with a single bullet in a fair stalk and the incidents of the day will never fade from your memory." His adventures while hunting big game were varied and were recounted by him is a plain matter of fact style which spoke more for the high courage of the man than pages of superlative description could have done. Writing of a Bison hunt he says, "When a Bison charges he commences by running at you with his head well up and nose in the air, and only kicks his head down when a few yards off. At least that was the way the ones that charged me behaved." His description of an exciting encounter with a bear is also worth quoting, the infuriated animal, on being hit charged up a tree on which Mr. Inverarity was sitting "So quickly did she came that although I never reloaded quicker in my life she reached by legs just as I got one barrel reloaded, she was on the point of seizing my leg with her teeth when I fired and dropped her." Mr. Inverarity's Hunting Expeditions were not confined to India. He made two sporting expeditions to Somaliland, the first, in 1889, was cut short at the end of a fortnight by a misadventure. In his article or notes on "The Mammalia of Somaliland" Mr. Inverarity, beyond a reference, does not tell us what the misadventure was—it consisted in nothing less than his receiving a severe mauling from a lioness. Later in describing the charge of a lion he says: "They charge with the same coughing roar that a tiger does, the lion comes at a great speed close to the ground, not leaping in the air as you see in the picture. The ears are pressed close to the head, giving the animal the appearance of being without ears." So much for the observations made while the lion was actually charging him. Further he writes, "So large an animal coming at full speed against you naturally knocks you off your legs. The claws and teeth entering the flesh does not hurt so much as you would think. The only really painful part of the business is the squeeze given by the jaws on the bone. I felt none of the dreamy stupor Livingstone describes, but on the contrary felt as usual; I adopted the course of lying quite still which is the best that one can do, as you are quite helpless with a heavy animal on you and they are inclined to make grabs at everything that moves, and the fewer bites you can get off with the better. All the wounds are centres of inflammation and blood poisoning and the more you get the less chance you have. The power of the lion's jaw may be conceived from the fact that the Lioness that seized me, although it had a broken jaw, scored deep grooves in the barrel of my rifle with her teeth. Some claw wounds were mere scratches which I attribute to the fact that they clutch at the surface of your coat, thinking that is all solid underneath, and so reach the flesh pretty late, in fact my coat was torn in some places without any corresponding wound beneath. I never felt the slightest shock." The second expedition in 1890 occupied two months. He was on this occasion fortunate in getting good specimens of "almost all the animals found within a hundred miles of the coast." His articles are illustrated by wonderful series of photographs (taken by the author) of the animals shot by him and always include accurate descriptions of them. Mr. Inverarity was a skilful amateur photographer and the results of his work are to be seen in the many photos of big game animals now hanging on the walls of the Prince of Wales' Museum, Bombay. Mr. Inverarity's writings in the Society's Journal would make an excellent guide book for sportsmen in India, written as they are by a man who combined with other great gifts, the keenest power of observation and a great love of nature and outdoor life. The following articles from his pen give an idea of Mr. Inverarity's varied experiences as a big game hunter and naturalist:—

Unscientific Notes on the Tiger, Vol. III, page 143; Stalking the Indian Bison, Vol. IV, p. 294; Wounded Bear charging up a tree, Vol. V, p. 380; The Mammalia of Somaliland, Vol. VI, p. 457; Does a Tiger kill Snakes? Vol. VII, p. 405; A Bear with three cubs, Vol. VII, p. 406; Sambar and Sambar Shooting, Vol. VIII, p. 391; Man Eating Panthers, Vol. IX, p. 25; The Four-horned Antelope, Vol. IX, p. 193; The Oorial, Vol. IX, p. 322; The Cheetal or Spotted Deer, Vol. IX, p. 481; The Indian Wild Buffalo, Vol. X, p. 41; The Indian Wild Dog, Vol. X, p. 449; A Wild Dog's Earth, Vol. XIII, p. 529; Abnormal Sambar Heads, Vol. XIV, p. 378; Sambar Horns, Vol. XVII, p. 23.

Mr. Inverarity died as he would have wished in harness, being taken ill in his Chambers at the High Court on the 4th December 1923 and passing away that same evening.

MISCELLANEOUS NOTES.

No. I.—ON THE FORMS OF THE HIMALAYAN SEROW *CAPRICORNIS SUMATRÆNSIS.*

(*With* 2 *Plates.*)

In 1913 there was an article by Mr. Pocock in the Society's Journal (J. B. N. H. S., xxii, p. 296) on the serows, and in this article the author reviewed the forms of the genus *Capricornis,* and treated them all as sub-species of *sumatrœnsis.*

In his "Summary of the Indian Manual Survey" (J. B. N. H. S., xxvii, p. 80) the late Mr. R. C. Wroughton has retained the same key and subdivision, which I repeat.

Key to the Forms of *Capricornis sumatrœnsis.*

- A.—Head, body and limbs not all red.
  - *a.* Head and body brownish black or black.
    - *a*1. Legs white or dirty white below the knee.
      - *a*2. Belly only a little paler than the sides, their colours blending; much less white on the jaw, throat, and breast .. .. 1. *s. thar,* Hodgs.
      - 2. Belly white, sharply contrasted with the rufous brown of the sides; much white on chest and along lower jaw.. .. .. 2. *s. rodoni,* Poc.
    - *b*1. Legs with a considerable amount of rusty or yellow below the knees and hocks.
      - *a*2. Legs below knees and hocks all rusty; body brownish black .. 3. *s. milne-edwardsii,* Dav.
      - *b*2. Legs below knees and hocks rusty fawn; knees and fetlocks white; body jet black .. .. .. 4. *s. jamrachi,* Poc.
  - *b.* Head pale chocolate brown, body probably that colour also, and legs probably white below the knee .. .. 5. *s. humei,* Poc.
- B.—Head, body and limbs all red .. .. .. 6. *s. rubidus,* Bl.

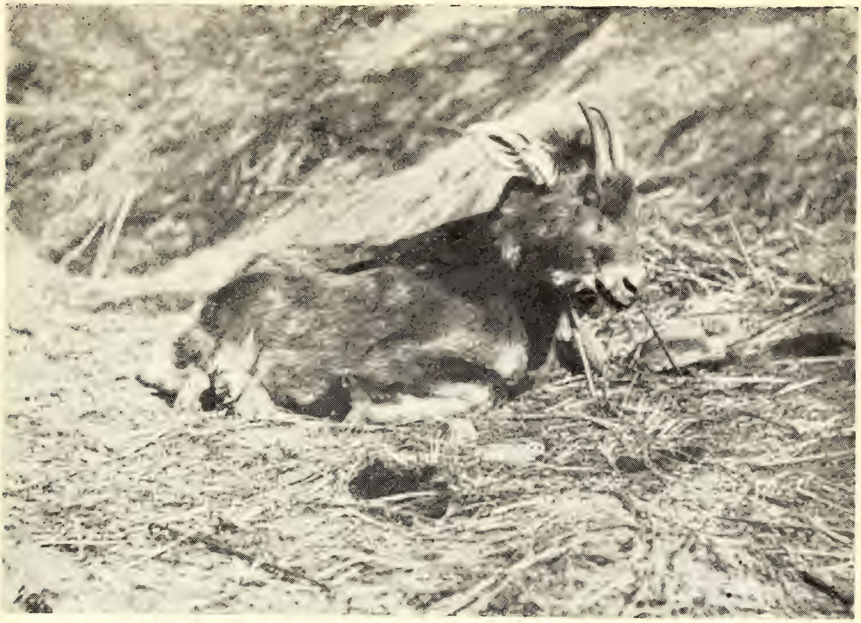
Distribution

1. *C. s. thar* .. .. *Type locality* :—Nepal. (Hodgson).
Other localities :—Sutlej Valley, Kumaon: Nepal; Sikkim (B.M.)
Lectotype :—B.M. No. 43.1.12.89.

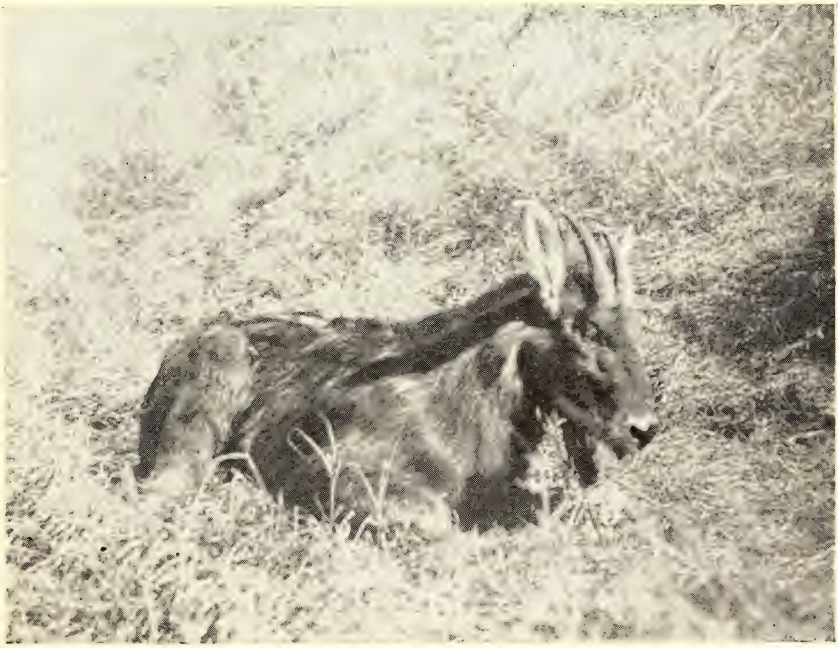
2. *C. s. rodoni* .. .. *Type locality* :—Chamba State, Punjab. (Rodon.)
Other localities :—None.
Type :—B.M. No. 2.12.11.1.

3. *C. s. milne edwardsi.* *Type locality* :—Moupin, Sze Chuen.
Other localities :—Sze Chuen; Pegu; Moulmein; Mount Muleyit; Tenasserim (B.M.); N. Shan States Pegu (M.S.I.)

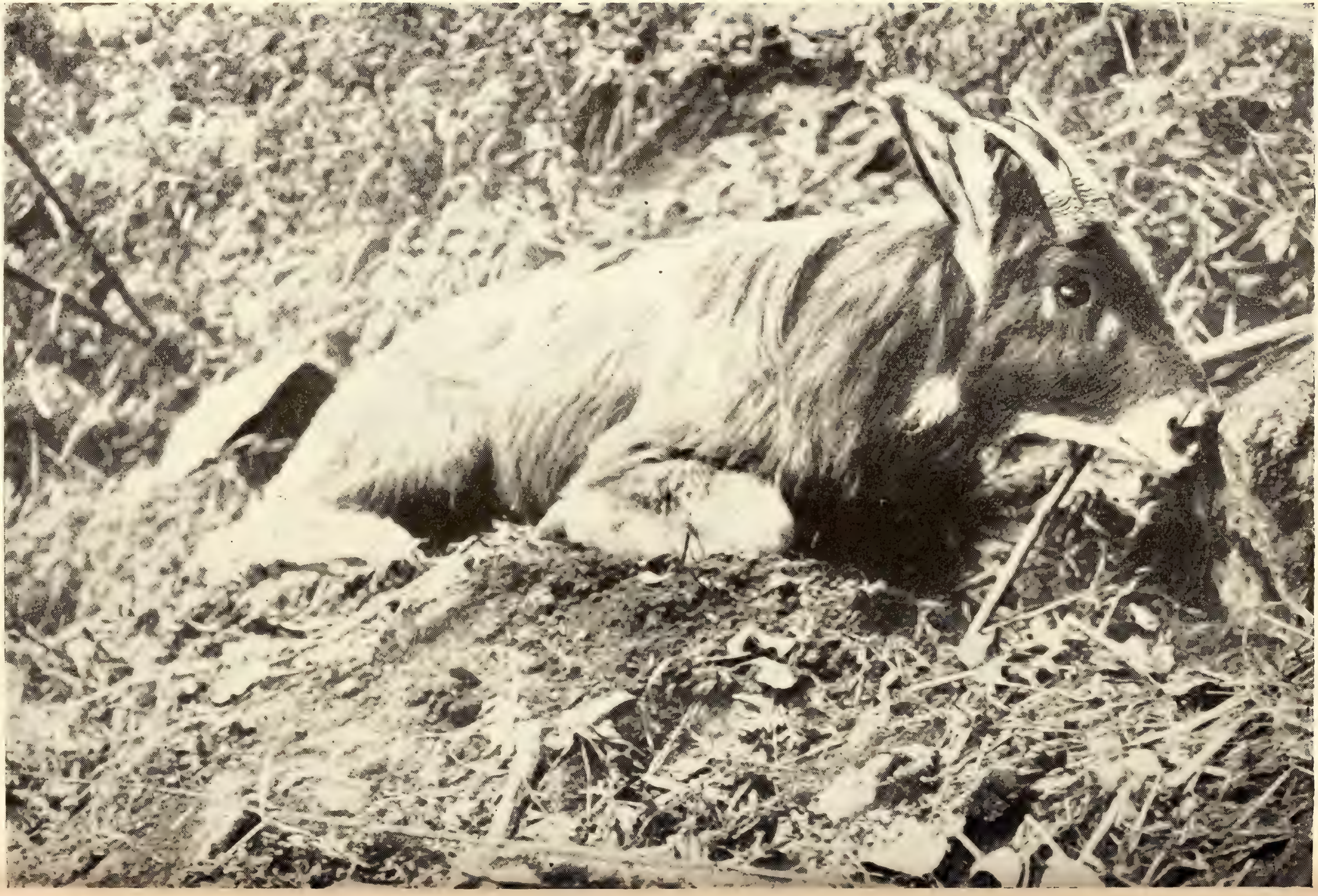
4. *C. s. jamrachi* .. *Type* :—Perhaps in Paris Museum.
Type locality :—Kalimpong, Darjiling.
Other localities :—Kurseong, Darjiling (B.M.)
Type :—2.10.12.1.



FEMALE SEROW, Kishtwar, Chenab Valley, April 1911.



OLD MALE SEROW, Kashmir Valley, October 1922.



Large female Kashmir Serow showing white area on the undersurface of the jaw.

5. *C. s. humei* .. .. *Type locality*:—Kashmir. (Hume).
Other localities:—Pir Panjal, Kashmir. (B.M.).
Type:—B.M. No. 91.8.7.65.
6. *C. s. rubidus* .. *Type locality*:—Arakan.
Other localities:—Arakan (B.M.)
Type:—Not traced.

The above key struck me at the time of its first publication as most unsatisfactory, and, in particular, the description of *C. s. humei*, based on one 60-year old headskin only, as being quite unwarranted.

I have now collected particulars of 23 specimens of serow, as under:—

(1) An adult female shot by me in Kishtwar, and another adult seen at the same time.

(2) Eleven headskins, five of which had the body skins with them, of 7 males and 4 females, examined in the shops of Srinagar skin curers. All these came from the Kashmir Valley, and included specimens from the Liddar, Sind, and Bandipur rivers, and one from the Pir Panjal.

(3) Three headskins, 1 male and 2 females, shot in Chamba in the same month: all adults.

(4) A careful examination of seven living serow in the hills a few miles N.E. of Srinagar. These seven individuals comprised three adult males, three adult females, and one young one which I judged to be 6 months old. I shot the oldest male. This was during last October (1922).

I will first take the descriptions of the individuals coming under (1) and (4), as offering no chance of the skins having been discoloured or faded in any way:

(*a*) My own serow skin. The old male shot under (4). Shot Oct. 1922.

Description.

Legs white below knees.
Belly white.
Back and sides black, merging into rufous on rump, lower shoulders and thin band above white of belly.
Tail black above, white below.
Head and neck black, with small patches of white on angle of jaw and throat.

(*b*) The female shot under (1)

This animal agreed very much with the old male, except that she had no rufous colour on the buttocks and more on the sides, while she had very little white on the jaw-bones, but a large patch on the chest.

It would be expected, if Mr. Pocock's description of *C. s. rodoni* were a good one, that this female, being shot 200 miles nearer Chamba (in fact not 30 from Chamba State) would have shown the "much white" on the lower jaws described by Mr. Pocock as being characteristic of *C. s. rodoni*.

(*c*) Again the adult male seen at the same time as (*b*) had no white on the jaws, but had a large patch of white on the chest. In other respects he corresponded with (*a*).

(*d*) Of the remaining six living individuals examined last October, the two old males corresponded in body colouring to (*a*) but while one had a considerable amount of white on jaws and chest, the other and older animal had a very small patch of white on the chest and none on the jaws. The older male appeared to be the same age and size as that which I shot, and had the same amount of rufous on the buttocks, the youngest of the three having a much greater proportion of black in his colouring.

The two females seen had no rufous on the buttocks, only on the thighs and lower shoulders, and a thin band along the side merging into the black of the back and the white of the belly. I could see no white on the jaws, and a very small patch on the chest in one case, and a large one on the chest in the other.

The young one (a male I think) had no trace of white on the face or chest, but was entirely black to just above the knees and hocks, which were white, as were the legs below them. There was a small amount of white on the abdomen and inner thighs.

The general impression given me by the living animals was that the rufous tint increases with age, and that the amount of white on the head and chest is extremely variable in individuals.

This impression is borne out by the skins referred to under (2), and the amount of white on the face is undoubtedly an individual peculiarity. There were two heads from the same valley in Kashmir hanging on the wall of a skin-curer's shop in Srinagar last October. One had a patch of white on the angle of each lower jawbone, while the other showed no white at all.

It will be seen from the above descriptions that there is no serow of a pale brown colour from Kashmir, and we can eliminate *C. sumatrœnsis humei* without question. Mr. Pocock admits describing it on the strength of one 60-year old faded headskin, and this seems another case of describing a new race on insufficient material. It is to be noted that the necessary material for checking this description could easily have been obtained through the Bombay N.H.S. or through the Secretary, Game Preservation Department, Kashmir.

Now let us turn to *C. sumatrœnsis rodoni*. It is noticeable that the description of this race is based on only one well-defined characteristic;—namely the amount of white on the face and lower jaw. It will be seen, on reference to the Kashmir specimens, that the white is an individual characteristic, and that the specimens from the Chenab Valley, Kishtwar, which would be expected to show much white on the head, if Mr. Pocock's differentiation of *rodoni* were warranted, show little white on the head.

Again, I had the privilege of examining three serow heads shot in the same valley in Chamba on the south side of the main range and the amount of white on the head differed in every case.

Now let us turn to Lydekker's description of the serow, as given in his "Game Animals of India."

"As regards colour, the Himalayan serow may be described as blackish or dark grey on the upper-parts, with a generally grizzled appearance, owing to the whitish bases of the hairs, the head, neck, and mane being black. On the flanks, buttocks, upper portion of the limbs, chest, and throat, the black of the back passes into rusty red, which in turn gives place on the under part of the body, the inner side of the thighs, and the lower portion of the legs to dirty white or greyish; the inside of the ears and the front and sides of the chin being likewise white, but of a purer tint. Frequently a black line down the back may be more or less clearly distinguished.

". . . . . the typical Sumatran, or eastern, representative of the species (*Nemorhœdus bubalinus typicus*) is specially characterised by the lower part of the legs being rufous, instead of white or grey, as well as by the more rufous tinge of the hair generally. Apparently the size is not equal to that of the largest specimens of the Himalayan race, although small examples of the latter do not exceed the present race in this respect.

"Probably there is a complete transition from one race to the other, since a specimen was killed by General A. A. Kinloch near Darjiling, which in point of colour was intermediate between the two. Apparently the geographical range of the typical race extends from Sumatra through the elevated tracts of Siam, Burma, and Assam, to the Eastern Himalaya. It is commonly called the Burmese serow, but as it is typically from Sumatra it is better indicated by the name of that island, if indeed the Sumatran and Burmese animals are inseparable.

"In habits the Sumatran serow is doubtless identical with the Himalayan race, although it inhabits somewhat lower elevations. The red colouring of the limbs indicates that it is a semi-melano as compared with the Himalayan race ; red or tan on the limbs and underparts in association with black above being, as Mr. R. I. Pocock has shown in the case of black-and-tan dogs, the first stage on the road to complete melanism."

Lydekker's description seems to me to cover all Himalayan serow, and it is noticeable that he has omitted all mention of a white patch on the chest, which looks as if the materials on which he based his description varied from that utilised by Mr. Pocock ; the inference is that Lydekker took this white patch to be a variable individual character.

I would suggest therefore that we can safely eliminate *Capricornis sumatrænsis humei* and *C. sumatrænsis rodoni* and class all Himalayan serow under *Capricornis sumatraensis thar* ; with the possible addition of *C. sumatrænsis jamrachi* though it seems very desirable that more material be obtained before the latter race can be considered as definitely established.

Since writing the above I have seen six more serow in Kashmir in the wild state, which fully bear out the conclusions already arrived at. I give a photograph of a very large female which was entirely white on the undersurface of the jaw, the white also invading the outside of the jaw and the muzzle. This serow was shot within half a mile of the place where I killed the big male last October, of which a photo is given. The amount of white is evidently individual.

RAWALPINDI,
November 1923.

C. H. STOCKLEY,
Major.

No. II.—A PANTHER SHOOT IN SIMLA.

With a plate.

The following account of the shooting of a panther at Simla may be of interest to those familiar with that place,as it certainly was of interest to my fellow " Shikari, " if not to myself. The scene is laid in a cup shaped valley immediately below Summer Hill, overlooked from one direction by " Potter's Field" and over-looking in the other a valley of steep declivities and fields snatched from the hill side. Clouds on the distant peaks, a wandering thunderstorm and the incessant clamour of insect life heralded the monsoon and the probability of a damp vigil; a description that may serve to recall conditions familiar to some of my readers and one that is ample for my purpose.

By devious paths I descended the hill side to my machan, a contraption of two boards roped to two saplings, and scrambling up was seated by 5 p.m. shut off from my surroundings in all but one direction by a screen of fir branches. Through a small aperture I could see the goat tied to a stump in the ground at a distance of two or three yards only from bushes bordering a track along the thickly wooded hill side. My companion was seated on a ledge 500 feet above me with a view of goat, machan and hill-side as perfect as could be desired.

Meanwhile the game had commenced below. The first twinges of cramp were timed 5-30 p.m. and long before this I had been assailed by large and voracious tree-ants whose attack was admirably supported by flights of mosquitoes. Man is not invincible and at 6 p.m.—my watch was on the boards between my knees —I had relapsed into a stupor,engendered by the agony of restricted movement, formic acid and other irritants, from which the movements of the goat even failed to rouse me. The shadows lengthened, the sun set behind " Potters' Field" and objects seemed to become clear for a moment before gradually merging one into another and the whole into an ever deepening obscurity. The goat seemed singularly passive, standing up and facing away from me until 7-30 p.m. when a barking deer gave disturbed tongue in the undergrowth above me. I became alert at this sign of alarm and peered through my peephole to the limit of my horizon, but except for the goat which still stood rivetted and motionless I could see nothing and guessed less. I relaxed my limbs with every care and was meditating on the waste of time involved in my present pursuit when with a swerve and a rush from behind a bush a couple of yards from the goat dashed a magnificent panther, every rippling muscle of its body revealing perfect condition and peculiar ferocity, I glanced at my watch which told 7-45 p.m. and, quietly picking up my 12 bore, loaded with contractile bullets, waited for a favourable opportunity. In a minute the panther presented its side to me and I was enabled to obtain an uninterrupted aim at its shoulder. Over it rolled and crashed down the hill to utter a couple of strangled coughs—then silence. Night was fast approaching and my retreat having been covered by my companion and others, we left the search until dawn the following morning. Of all animals perhaps it is least advisable to take liberties with a wounded panther and our decision to allow wounds to stiffen could only have been wise. My companion had been charged in similar circumstances the previous year which added to our disinclination to set about an immediate investigation.

From a comparison of notes I discovered that the panther had arrived behind that bush at 7-15 p.m. and was observed immediately on arrival. It could not have been more than 20 yards from me. It lay, belly pressed close to the earth, intent on its prey which must have viewed it simultaneously. At intervals it was seen from above to crane its wicked head forward to obtain a better view until finally it gathered itself for its rush. The experience of the watchers on the heights above, who wondered if I had seen the beast, whether I would move and disclose my position, whether it would attack the goat and, if so, whilst there was light to see, was infinitely more a matter for sympathy than my own. I had two minutes in which to think; they had 30 minutes.

At dawn we were above the spot with dogs of every shape and form, and men to assist in the search, but the end was near. The panther, a male, was found lead some thirty yards down the "Khud" and it only remained to return with it in triumph. A bullet hole in the shoulder, especially that of a devastating contractile projectile, had proved sufficient. Its measurements were 6 ft. 9½ inches, large for a hill panther. I enclose a photograph. Had it not been for the gracious permission of His Highness the Maharaja of Patiala, within whose territory the beast was bagged, this story would not have been written.

SIMLA, ROSTAND.
6th July 1923.

No. III.—A FRESH HYPOTHESIS IN REGARD TO PROTECTIVE COLOURATION IN ANIMALS.

In March 1888 being one of a party of six guns out after tiger in the Nepal Terai I had one day my ideas of a tiger's extraordinary power of concealment very markedly illustrated.

Well away to the left of the beating line of elephants (60) I saw that a good bit of ground would be left out of the beat. Directing my mahout to guide his charge in a wide circle to the left we got into a position ahead of the beating line, but out of touch with it, taking up a position on the left bank of a dried up stream. The banks of the stream were covered with Noogla jungle from 10 to 15 ft. in height. Looking at our surroundings I thought that a tiger would stand out very clearly (1) in the dark Noogla-Jungle, (2) on the clear yellow sand, (3) in the dark Noogla grass.

Suddenly I noticed that the elephant's ears were fixed and directed forwards, his trunk was also fixed. Listening tensely I could hear a faint swish swish coming to us from the left, and the mahout looking up, I whispered '*bagh ata hai.*'

I then asked him if his charge was steady to the tiger, he replied in the affirmative, and I could see from his manner that he was not nervous. Elephants are often said to be nervous or frightened in the presence of tigers, whereas it is the mahout who is nervous, and who, sitting on the neck of the elephant, communicates his feelings to his charge. Getting the rifle ready I thought that the tiger must stand out very clear in the dark Noogla, but as he appeared I was struck with his darkness, and delayed firing as, such a dark body, must stand out very clear on the sandy bed of the stream. Instead of being a dark body on a very light yellow glittering ground, I could see a light coloured body crouching and quickly passing over the sand into the dark Noogla of the opposite bank ; in the Noogla he was again a dark body. No time was to be lost, and too quickly firing with the left I missed, but dropped him in his track with the right barrel. The mahout beamed with delight and taking his elephant up to the dead tiger circled round it making much of his charge.

The lightning like changes that that tiger assumed in passing through and from a dark surrounding to over a light surrounding and from a light to again into a dark surrounding, opened my eyes as to the difficulties to be met in the pursuit of big game.

I have often tried to think out the nature of this camouflage and have come to the conclusion that it is due to the influence of the optic nerve on the skin muscle *Vaniculus carnosus.*

When the eye meets a dark surrounding the skin muscle is contracted, bringing the hairs close together thus densifying the general colour tone. When a light colour is met the muscle is slackened, the hairs are loose standing out alone with the light passing through them, the whole blending with its light surrounding.

In "Sport in Eastern Bengal" by F. B. Simson, instances of concealments by tigers are given on p. 133.

> "A tiger will hide himself in places where a cat or a hare you would think might be easily seen. They reduce themselves to the smallest possible compass

and choose spots where the colour and markings of their skins correspond with the roots and stalks of plants. I have had a tiger shown to me asleep, and though within distance of his spring I have only been able to distinguish him after very careful examination. I have come to the very last bush of screw pine jungle and almost have left it as untenanted, when a tiger, larger apparently than the bush itself, has appeared from under it. I have beaten all the nice and likely jungle, when I had positive and certain information that a tiger was close to me and have found him finally in a patch of weeds only high enough, I would have thought, to have given cover to a Civet cat. I have known a tiger almost conceal himself on the bare muddy sand of a river bank, and again I have known them retreat at once to the thickest, densest and most impracticable jungle near. I have known them leave thick jungles almost at the first noise of the beating elephants, I have known them also remain crouching till the elephant has all but trod on them. If you have reliable information that a tiger has entered a jungle just before you came to it, if you can find no trace of its exit it is generally worth while to beat it again and again till you can account for your want of success."

These observations were made by a man who gave up all his spare time in 21 years' service in India to the pursuit of big game, killing I have been told, between five to six hundred tigers.

Sir Herbert Maxwell, to whom I forwarded this note, in commenting, writes as follows:—

"Your note upon the protective colour of the tiger is very interesting. Having never been in India, I have no experience of optical effects in the jungle: but I find it hard to believe that a change of colour could be effected so instantaneously as you describe in an animal so highly organised as a tiger. No doubt your eye received the impression of change, but the colour sense is purely subjective, and is powerfully affected by light reflected from the environment of the object immediately under observation.

Pray do not suppose that I dissent from your hypothesis of the movement of the skin muscle and its effect upon the absorption and reflection of light. It seems to me a very proper subject for further research, and I certainly have no more plausible theory to propound."

Professor J. Arthur Thomson, the University, Aberdeen, has also commented upon this theory: he writes to me:—

"It was very kind of you to send me such an interesting letter. Alfred Russell Wallace used to speak of "not knowing where tiger ended and jungle began," but your experience is more subtle. Your theory of the influence of the skin muscle on the disposition of the hair is quite new to me. One would like to corroborate it by actual observation."

INVEROAK, GERRARD CROSS BUCKS, ENGLAND, W. FORSYTH.
23rd June 1923.

No. IV.—THE MISHMI TAKIN (*BUDORCAS TAXICOLOR.*)

Mr. Cooper's remarks on the distribution of the above animal in the Mishmi Hills (Journ. B.N.H.S., Vol. XXIX., p. 550) are very interesting, and perhaps I may be permitted to add a note culled from my experiences when collecting for the Mammal Survey in these same hills in 1921. My work lay chiefly in the Dening and Dreyi area amongst the Digaru Mishmis who are for ever hunting the Takin, as witness the number of spoiled heads that may be seen in the Sadiya Bazar and purchased for a few rupees. One especially keen hunter was old Blyna of Dreyi who was my assistant for some time in trapping, and whose name chiefly lingers in my memory on account of his foul pipe and capacity for consuming opium. He was an inveterate poacher (much to my advantage as regards mammals) and I think knew as much of the Mishmi fauna as anyone in the district. From him and other Mishmis I often had requests to go up and shoot Takin. According to him these were to be found about two days trek from Chikorpani up towards the Headwaters of the Digaru River. The mountains here do not rise above 7,000 feet and if Takin were to be found at this elevation in April and May it is obvious that they come down much lower during the winter, as snow was lying on some of the inner ranges on the 21st April. I also heard of them on the range 6,000′ which divides Dreyi from Theroliang, and about four miles northward along the spur I came across numerous tracks which I took to be of the Takin. Blyna also told me that he has shot the Takin at Doloipani in the country of the Meja Mishmis which lies on the route to Rima in Eastern Tibet. I had no time to spare to really go after these beasts as I was busy on most days with the smaller mammals but I have no doubt that with a certain amount of diligence they would be found to be commoner than is generally supposed, a theory which is helped in no small measure by the great difficulty of getting off the beaten track in the Mishmi Hills.

BOMBAY, H. W. WELLS.
15th August 1923.

No. V.—NOTES ON PORCUPINES.

I have always found the porcupine an interesting animal in all the parts of Asia and Africa in which I have made my home from time to time. My first acquaintance with this nocturnal marauder was on the North-West Frontier of India, where it was very common in the precipitous valleys and clefts running through the barren hills of Waziristan. Many of these valleys were well watered and usually contained crops which our spiny friends would raid during the night. Military posts were frequently located in similar situations, and gardening was rendered well nigh impossible by the persistent attentions of these elusive thieves.

No walls or hedges could be made strong enough to keep them out: if traps were set at the gate-ways the porcupines tunnelled their way in beneath the massive stone walls: if snares were set at these holes, they came in at the gateways.

Occasionally one would get caught by the leg in a gin but it quickly solved the problem of its safety, by gnawing through the leg, and that is all we would find left in the trap when we visited it in the morning. I always hoped to remedy this by setting a group of traps, only to discover that they were scrupulously avoided.

It is readily admitted that the safest remedy is to attack these pests in their own homes, but there again we were completely thwarted in our endeavours.

These hill porcupines had their lairs dug deep into the cliffs which often towered hundreds of feet above the level of their earth.

To attempt to dig them out under such conditions was quite hopeless, to smoke them out or suffocate them with poisonous fumes was equally futile; as all the 'earths' were well ventilated with numerous inaccessible cracks and crannies.

All this was exasperating enough, but the final straw was the fact that there was a method by which there was a remote chance of getting even with these slippery customers, and that was by sitting up for them in the moonlight, and even then it was uncanny how the porcupines would be conspicuous by their absence on the nights that there was a watcher in the garden—this method however was denied to us.

Liberties such as sitting up in the moonlight in a garden outside the walls of the protecting fort, cannot be lightly undertaken on the Indian Frontier. For we have to reckon with the raiding Mansud or the fanatical Ghazi—night prowlers of the worst type—ever watchful for the opportunity to loot and to slay; and their constant attentions practically make such night vigils quite impossible.

The scene now changes to the Chanda Jungles of the Central Provinces in India, recalling to me some of the happiest memories of successful shikar expeditions, and there I became better acquainted with porcupines and their habits as they were comparatively easy to tackle in those haunts.

I had always wanted to dig out an 'earth' and very conveniently found one in the heart of the jungle, at a time when my activities were perforce confined to quiet natural history work, as I did not want unnecessarily to disturb the countryside while I was waiting for a tiger to be lured into killing one of the baits I had put out for him.

My attention was first of all attracted to the 'earth' by a variety of animal skulls lying in its vicinity which the porcupines had been gnawing, and it was soon evident that the tenants were at home. There were two or three bolt holes near the mouth of the burrow but only one main tunnel, and before we commenced work we closed all the exits.

I had no intention of digging out the whole length of the 'earth' though I was very anxious to determine the general length, depth and size.

First of all with the aid of a stick about ten feet in length we tested the direction of the tunnel, and by tapping on its roof located a spot above ground to dig down to it.

The soil was soft and digging easy, and this procedure was repeated till the dwelling chamber of the animal was reached.

Each shaft that was sunk to the tunnel was about four feet in diameter and when completed the earth was blocked at that point, so that section by section we were gradually cornering its unfortunate inhabitants in the chamber at the end. I should like to mention at this point that, having from time to time dug out a good many porcupines in different countries and under very varied conditions, I have come to the conclusion that they rarely if ever dig out 'earths' of their own, but invariably appropriate those of other animals which they enlarge—if necessary—for their own use.

When tapping forward with the long stick after sinking the third shaft, evidently one of the porcupines was encountered, and a chattering noise and a distinct scampering was audible.

At the fourth shaft we had our first glimpse of the terrified creatures which made desperate, though fruitless, efforts to get out; and it is quite extraordinary the way in which I have sometimes seen these animals negotiate the banks of deep, steep shafts and temporarily escape.

In this instance I had no intention of letting them get out until I wanted them to, and when we broke into the tunnel at the fifth shaft and found ourselves at the entrance of the dwelling chamber, and end of the earth, the whole space below us appeared to be alive with porcupines.

Eventually we discovered two three-parts grown youngsters—both females—and a full grown pair, one of which contained a well formed youngster in the fœtus state, about the size of a small rat. I found the youngsters exceedingly tasty and nice to eat, but the old animals, though providing rich and excellent eating, are apt to be a trifle strong, and I have not yet acquired the taste necessary to appreciate them. The earth was nearly sixty feet in length, and the chamber almost five feet below the level of the ground. The tunnel was just sufficiently large to admit of the passage of a full grown porcupine, but the animal could not turn round until it reached the chamber at the end.

This dwelling place cannot have been more than four square feet in area and probably averaged eighteen inches from its floor to the roof. It seemed to me very small compared to what it contained, but I always think the same about every porcupine 'earth' when I eventually arrive at the end.

Dabbling in Natural History work during the Mesopotamian campaign next brought me into contact with this species near the Rivers Euphrates and Tigris in 1917 and 1918.

On the Euphrates I found their refuges near Feluja, due west of Baghdad, and amongst the ruins of the ancient Persian fortress of Anbar.

In the Tigris area I found them common in the cliffs of the Adhaim river,a few marches downstream of Samarra--in the high, steep banks of that huge monument of ancient irrigation works,the Nahrwan Canals, and amongst the rivers of Eski Baghdad in the vicinity of Samarra itself, where a succession of Caliphs each attempted to build a city which would outrival Baghdad, and all of whom failed in the attempt.

Amongst these rivers, in the majority of cases, their refuges were quite inaccessible, but I discovered one that offered a fair chance of success.

Digging was well nigh impossible as a great portion of the ruins were mixed up with a type of hard lime-stone conglomerate.

However, with the united efforts of nearly two dozen men working hard for a couple of days, the owners of the 'earth' were eventually captured; but they were so severely mauled in the process that they died at once. The female was the heavier of the pair and weighed 25 lbs., while the male only scaled 23 lbs.

This 'earth' was of natural formation amongst the hard, conglomerate blocks, was over thirty feet length and terminated in quite a roomy chamber also of nature's handiwork.

This species has not yet been fully identified nor named by the British Museum experts, and may prove to be something new.

In Palestine I knew of the existence of porcupines on the Jordan side of the Judea Hills, but failed ever to bring any to bag.

Finally, there are my East African experiences with these mischievous creatures, and I have previously, in an article in 'The Field' on the subject of small mammals in Kenya Colony, generally described their habits in that country but at that time had not had the good fortune to dig out a new habitat.

Most of the normal lairs are far too rocky to permit of the owners being dug out, but during the harvest season they temporarily occupy untenanted pig holes in the vicinity of the mealie fields, and are then quite easy to suffocate or capture. These pig holes when converted to their own use by the porcupines are rarely more than 20 feet in length, but the same porcupine or a pair will often have several such holes at their disposal.

(A dog however will at once decide whether the earth is occupied or not.)

The biggest specimen captured by this method was a fine female weighing considerably more than 30 lbs. The small path made by the porcupines through the long grass, when on their nightly raids to and from the mealie fields, tell their own story—for these animals always follow the same track. My dogs I find will hurl themselves again and again on to the cruel spines in a vain attempt to close with their formidable antagonist, though I always try to capture or kill my quarry before the dogs can get near it.

However, one large dog, who has been severely mauled by Monkeys and Wart Hog, has learnt the trick of attacking the head only, and when he sees the opportunity he usually bites it in half.

In Volume XXIX, No. 2, of the Society's Journal,there is a query as to the porcupine's method of attack.

I have previously written at length in the Journal a few years ago as to the method of attack from my own painful experience—and I can now further add to my observations by reason of frequent encounters with porcupines during recent years in Kenya Colony.

When the porcupine is attacked by dogs it does its best to keep its tail towards its tormenters, and to do this wheels from side to side with remarkable agility.

All the time the quills are kept erect, forming an extensive prickly shield, which when turned sharply in any direction acts as a sufficient barrier to prevent the dogs bringing home their attack.

Though the dogs hurl themselves time and again at the porcupine they always retire discomfited, but do little damage to themselves beyond superficial injuries from the cruel spikes, many of which are left embedded in their skins. But the porcupine does not take a passive part only in the proceedings, for when it sees its opportunity it hurls itself backwards with incredible rapidity and no mean force, backed up as it is with a weight often exceeding 30 pounds. Then it is that fatal injuries are inflicted with a bunch of short hard quills near the base of the animal's spine, and dogs frequently get pierced to the brain and killed when attacked in this fashion.

One of my dogs has now learnt the trick of disabling porcupines—as he waits till the animal is busily engaged with the rest of the pack, and then he rushes in and bites the porcupine on the head.

KENYA COLONY, C. R. S. PITMAN, MAJOR.
14th July, 1923.

No. VI.—CHANGE OF COLOUR IN THE BLACKBUCK (*ANTILOPE CERVICAPRA*).

The correspondence in the *Field* on the subject of the colour change in the coat of the Black Buck is not without interest to sportsmen in India. We publish below the letter which appeared in the *Field*, together with the editor's comment. We are also able to include observations on the subject received from members and would welcome further opinion :—

"In the *Field* of May 24th there is a note about an abnormal black buck horn. You comment on this and state : 'The black is merely a transient phase assumed by the black buck during the breeding season.' I hesitate to join issue with the editor of the *Field*, but this not the usually accepted belief in India. All young buck are fawn-coloured like the does and gradually assume their black coats. Some, however, never seem to turn black at all. I was always told that the black colour is a sign of maturity. Certainly there are buck which remain black all the year round. I have been out in India over 20 years, and never once heard the suggestion that buck only assumed their black coat as certain birds assume their breeding plumage."

M. H. SIMMONDS (MAJOR, INDIAN CAVALRY).

Berkshire Club, Reading.

["Horns are abnormally developed now and again in the females of species of antelopes in which the male alone is typically provided with these appendages. There is a skull of a female black buck in the Natural History Museum with a pair of down-curved horns. It formerly belonged to Mr. A. O. Hume. The testimony of sportsmen as to the sex of the game they shoot must be accepted, especially when there is no likelihood of error. The probability of the colour-change of the male black buck being seasonal was suggested by the late Mr. Lydekker in 1907 (Game Animals of India) and was subsequently confirmed by Mr. Pocock from observations on a living animal in 1910. (Proceedings of the Zoological Society, 1910, p. 895). Mr. Pocock informs us that he has subsequently observed the same phenomenon in other specimens. It is quite possible, however, that in some cases the colour-change is permanently assumed after maturity; and it may be that the species varies in this respect in different parts of India. Information on this point from sportsmen would be welcome."—EDS.]

COMMENT BY H. H. THE MAHARAJA OF DHAR.

H. H. the Maharaja of Dhar, writing on this subject, says:—I think that there is much truth in the statement that "In some cases the colour-change is permanently assumed after maturity and it may be that the species varies in this respect in different parts of India." It is a parallel case to the length of horn attained by these animals which varies considerably in different districts. I venture to give my experiences in regard to these animals.

I. The young buck assume the black coat on attaining maturity.

II. The change from fawn to black in the young males is gradual, all stages of colouration, in which the density of tone varies, are observable but that highly-polished velvetty black, that sportsmen must have observed in the skins of certain animals, is only attained by the adult, and that, I believe, only at a certain season of the year, the condition being dependent on food, climate and local condition.

My experience and observations, made when collecting Black Buck skins for the Bombay Natural History Society, have shown me that although certain animals may be said to retain the black coat all the year round, there is, I believe, a distinct falling off or fading in the intensity of the black at certain seasons. Writing on the subject in February 1920 to Mr. Kinnear I stated that the full grown buck appear to attain the velvetty black colour about the end of October or early in November. It is interesting to mention here that it is written in the "Shastras" that the sun of the month of Kunwar (Ashwin) "Vishwamitri Unhala," which is concurrent with the month of September and October, is so hot that its rays blacken the backs of the black buck. The cause given may not be correct but there is truth in the time indicated. In December, possibly not till January, there is a falling off in condition and the coats appear to grow fainter. The change is dependent on local conditions, the abundance of food at the close of the monsoon, and the decrease in quantity as the dry season sets in being possibly a determining factor.

COMMENT BY MAJOR C. H. STOCKLEY, D.S.O.

With reference to the statement in the *Field* quoted from Lydekker's "Game Animals of India" and "subsequently confirmed by Mr. Pocock from observations on a living animal" that Black Buck assume their black hue in the rutting season and lose it later in the year, my experience does not at all accord with this. I have notes on Black Buck since 1902 from most parts of India where they exist, and the general trend of my observations has been to show that in the Punjab and Rajputana most (at least 90 per cent) bucks assume the black hue on reaching maturity and keep it for the remainder of their lives, except for a slight fading in the hot weather. This fading usually amounts to a rustiness of coat and no more. I have observations on black buck in the Punjab last year (1923) extending from April to August, which confirm this. I have only once seen a conspicuous instance in the Punjab of the black colour not being assumed, and that was in northern Patiala in the end of November 1919, when I came across a herd about 70 strong in some sand hills, and, though there were at least six mature buck with horns ranging from 21 to 23 inches in the herd, there was not a single black one amongst them.

In the United Provinces and Central India, I have found that some of the best heads were carried by brown bucks, though it was always a matter for comment when one came across bucks of this type in the cold season; whereas, in the hot weather, the proportion of mature brown bucks increased very greatly, and by the end of May at least half seemed to be brown. Travelling on the Jhansi-Bhopal section of the railway in May last year, and July this year, I took particular note of the numbers seen, and my earlier observations were fully confirmed. That there is no definite rule in the matter is amply proved by the existence of both black and brown mature bucks at the same time and place; and the most that can be said is that there is a greater tendency for black buck to lose the black hue in the hot weather in the central portions of India than in the north.

I think Mr. Pocock's observations are based on individuals in captivity, which are not to be taken as sure proofs of the same thing happening with animals under natural conditions.

One point I have noticed is that, particularly with the bigger and more massive heads, the buff colour on the nape of the neck seems to increase as the buck passes maturity.

NOTE BY MAJOR F. L. ANDREWS, O.B.E., D.C.M., DHAR.

The colour is assumed gradually and is permanent. All young buck (male) are fawn coloured like the doe and as they grow older so the coat becomes darker until maturity is attained. I think the darkness of the coat depends to the great extent on the nature of the country and the climatic conditions. I have noticed that the black buck of Mysore and Madras and Southern India are quite different in colour to those of Central India, United Provinces and the Punjab. In Southern India the coat of the buck very rarely turns black, it is more of a dark fawn and one never sees the beautiful black and white face of the buck found farther north, while a head with horns measuring 19″ is considered quite good. I have shot full grown buck with coats quite light brown and only a very little darker than the does. The sheen of the coats depends, I think, to a great extent on the season.

The length of horn seems to depend on the soil and food.

The coats certainly are thick in winter. In the Deccan the coats are darker and the horns longer than those of Southern India, but are not so dark or as long as the buck found farther north. Buck appear to thrive better on black cotton soil.

COMMENT BY MR. B. A. ROKEBY, CONSERVATOR OF FORESTS, DHAR STATE, DHAR.

1. My experience is that the colour-change is permanently assumed after maturity. There is a change in the thickness of the coat in the hot weather, like the case of all other animals. In winter their coats are thickened. In the case of tigers and panthers the summer coat is much lighter in colour.

2. I would add that it also depends on the time of the year. As to horns, my experience is that the best horns are to be obtained in the *driest and hottest* districts. In the east of Oudh, where the climate is damp, an 18″ head is considered quite good whereas in Bikaner anything under 24″ would be thought small.

3. I think the " gloss " of the coat depends on the season.

NOTE BY MAJOR M. WYLIE, DHARAMSALA.

The following note by Major M. Wylie, written from Nabha, Nabha State, supplies an instance in which the black coat has apparently not been assumed with maturity :—

> " I had the good fortune to shoot a fine black buck yesterday and having seen the details of the Jhind head in your August Journal I

thought the measurements of a Nabha head might be of interest. The measurements are as follows :—

Right horn	28½ inches.
Left horn	28⅛ ”
Between tips	31½ ”
Circumference	5 ”

The length is nothing out of the ordinary, though I imagine that few heads of over 28 inches are obtained now-a-days, but the spread between tips is the largest I have seen recorded, and another point of interest is *that the buck was a light brown colour—in fact just the same as the does and immature bucks of his herd.* Local people say that an old buck loses his colour, but I have seen many very long-horned black-coated bucks. This buck was still in his prime and lord of his herd. He was shot on the 9th November 1923 about 7 miles from Nabha City. The shooting in Nabha has been very strictly preserved for the last 12 years, the late Maharajah inflicting severe penalties on anyone found killing any game—in spite of the fact that he himself seldom if ever shot. The result is that game abounds—especially Black Buck, Nilgai and Pig, but so far no absolute record heads have been obtained. I have also been lucky enough to get a 10¼ inch Nilgai which I believe is a good head.”

No. VII.—DOUBLE NEST OF THE KASHMIR GREAT TIT (*PARUS MAJOR KASHMIRIENSIS.*)

It is not uncommon in England for instances to be recorded in which various species of the genus *Parus* have built double nests, but I cannot recollect seeing any record of a similar occurrence in India. It may therefore be of interest to describe a double nest of the Kashmir Great Tit, *Parus major kashmiriensis,* found at Lower Dharmsala (4,000 feet) on 31st May 1923.

The nest was placed under the top stone of a culvert wall on the motor road; the wall was of loose stone work without mortar. On lifting the stone I found two nests composed of the fur and similar materials affected by Tits: they were roughly speaking touching. In one nest were four moderately incubated eggs. In the other nest the Tit was sitting and she did not move at my inspection but remained there until I replaced the stone in spite of my handling the eggs in the first nest. The orderly who found the nest informed me that there was one egg under the sitting bird. The nest was unfortunately found by school boys and interfered with, and I then discovered that the single egg was incubated. It would seem that after laying and commencing to incubate four eggs the Tit built a new nest and started to lay a fresh clutch of eggs for some reason which does not appear.

DHARMSALA,
14th June, 1923.

HUGH WHISTLER, F.Z.S,
Indian Police.

No. VIII.—LATE AND EARLY SNIPE IN THE DECCAN, POONA DISTRICT.

With reference to Miscellaneous Note No. XXVII of Vol. XXIX, the following details may be of interest to sportsmen in this Presidency :—

I shot my last snipe last season on 3rd May 1923, which is the latest date I have ever shot these birds in these parts. It was a Fantail (*G. cœlestis*) ♀ and in particularly good condition. My shikari reported that he had seen birds both on 11th May 1923, and on 13th May 1923 but though in each case I went out on the following day I did not see any signs of them.

I have just shot my first snipe for this season yesterday, 11th September 1923, when I saw four birds, out of which I bagged three, losing the fourth which fell some distance away in thick ‘lantana’ and could not be found. The three birds picked up were two Fantail and one Pintail (*G. stenura*), and had evidently only just arrived as my shikari had been over the same ground two days previously when there were no signs of any birds. I fancy this date must be a record for these parts. Formerly September 22nd was my earliest date though I have heard reports some years ago of snipe being shot on September 15th or 17th, but was never able to verify it. I *saw* one last year on September 12th but missed it among some thick 'babul' trees.

C. W. I., POONA, W. B. TREVENEN.
12th September, 1923.

No. IX.—ON THE BREEDING OF THE BLACK-WINGED STILT (*HIMANTOPUS CANDIDUS*.)

The Black-winged Stilt breeds in small numbers at the Kallar Kahar lake in the Jhelum portion of the Punjab Salt Range, and a visit to the lake in July of this year gave me a chance of observing its nesting habits. As these were found to differ in some respects from those at the Sultanpur and other breeding grounds described in Hume's Nests and Eggs (2nd Edition, Volume iii, 353) a note on the subject may perhaps be of interest. The Kallar Kahar lake lies close under the northern slope of the Salt Range, at an elevation of 2,100 feet, and its waters are distinctly salt. It is roughly circular and nearly a mile across when full, its greatest depth being then about 4 feet. Occasionally, in years of drought, it dries up completely, as was the case in 1921. According to the District Gazetteer the reason for its saltness is not properly known, but it appears to be due partly to ordinary precipitation and partly to brine springs.

I arrived at the lake on the 26th June and the same evening found a Stilt's nest containing 2 eggs, one addled and the other on the point of hatching. The next day urgent work took me elsewhere, but before leaving I engaged a villager to make a thorough search for more. I returned on the 9th July to find that he had collected some 60 eggs, and, in spite of strict injunctions to the contrary, had succeeded in mixing up the various clutches. I had therefore to adopt the doubtful and very unsatisfactory expedient of separating them by appearance and state of incubation. It seemed fairly clear, however, that more than half of the nests found had contained 4 eggs, varying from very slightly incubated to hard set. Apparent clutches of 2 and 3 were mostly fresh but 3 such were well incubated. It is of course possible that some eggs were smashed by the searcher while collecting them.

On the 9th July I myself found 2 more nests, from which were taken 2 fresh eggs and 4 showing faint signs of incubation. Both these nests were on the outer edge of a wide belt of reedy grass from two to three feet high fringing the east end of the lake. They consisted of a kind of weedy scum, which covers considerable portions of the lake's surface, collected and built up, with a small reed clump as foundation, to a height of about 3 inches above the surface of the surrounding water, there some 6 inches deep. These little mounds were 8 or 9 inches in diameter, and the eggs were lying on them in a shallow depression lined with a few bits of grass. The whole mass was saturated with water, and pieces of the grass lining adhered to the eggs when they were taken from it.

The behaviour of the birds was as described in "Nests and Eggs", except in the case of the nest found on the 26th June, when both the parent birds stood a short distance away and continued uttering their harsh cry and flapping their wings until I had left the spot. This nest was situated on the south side of the lake, which is there fed by some fresh watersprings and has a bottom of black and evil-smelling mud in which one flounders up to the knees. It differed from those described above in being a thick pad of grass on a tuft in a swamp overgrown by some kind of creeping water plant.

I subsequently examined several of the nests from which my searcher had taken eggs. In situation and structure they were similar to those first described, except that where small mounds of mud showed above the surface of the water some of these had been utilized in preference to making heaps of scum. The local name for the bird is *Kakua.*

Other species found nesting on the lake were *Podicipes albipennis* (eggs taken in April and June) and *Gallinula chloropus* (eggs taken in July). I have little doubt that *Fulica atra and Hydrophasianus chirurgus* also breed there, but so far I have not succeeded in finding their nests.

JHELUM,
1*st August* 1923.

H. W. WAITE,
Indian Police.

No. X.—RANGE OF THE TUFTED POCHARD (*FULIGULA FULIGULA*).

In "Indian Ducks and their Allies" by Stuart Baker, it would appear that the Tufted Duck was not recorded from Kashmir before 1906, in which year two were obtained (page 286).

It may therefore be of interest to record that, on reference to my diary, I find I have a note that I observed some Tufted Duck, in company with Common Pochard, on a small lake not far from Shiggar in Baltistan on 12th August 1922.

There was no possibility of my mistaking the birds as I observed them through glasses from a short distance, and I am also well acquainted with the Tufted Duck.

R. F. RUTTLEDGE.

JHANSI, 4*th August* 1923.

No. XI.—LATE STAY OF PINTAIL (*DAFILA ACUTA*) IN THE C. P.

I shot to-day a pintail drake (*Dafila acuta*) at this place. They are winter visitors here but, as June is very late for them to remain, I write as your Society may care to have a record of the date. He was one of a flock of eight. Duck have been very late in returning to the North this year, and until quite recently the tanks in the vicinity have held large flocks of various kinds, principally *Querquedula circia.*

NAGPUR, C P.,
14*th June* 1923.

F. W. A. PRIDEAUX.

No. XII.—DRONGO AND CICADA.

Owing to their colouring, to their strong, sudden and short flight, it must be rare, I imagine, that the Cicadæ are preyed upon by birds. Recently, however, I witnessed such an occasion. I did not actually see the capture, but I heard the beginning of the tragedy and saw its gastronomic ending.

For reasons that will be obvious I cannot particularise as to the identity of the dinner but the diner was a common 'King Crow.'

Just before dusk I was seated, reading, by a jungle rest house and heard a cicada start off from the roof. Immediately after I noticed the wing beat of a bird and two snaps of its beak, the cicada evidently had jinked. This was followed by a loud continuous note from the insect and as I looked up I saw the bird make for a near-by tree with what must have been a large cicada in his beak. He perched so that I could not clearly follow the proceedings of the next two minutes; but, apparently he retained the prey in his beak and rapped it repeatedly against a branch. For full two minutes the unhappy victim continued to protest and then followed silence and presumably death. Just before this the bird shifted into better view, transferred the insect to his feet and proceeded to tear it into bits which were swallowed. This lasted for another three or four minutes. Then the Drongo wiped his beak on the napkin provided by nature, said grace and departed.

HORSLEYKONDA, C. E. C. FISCHER.
15th May, 1923.

No. XIII.—THE COMMON FLAMINGO (*PHŒNICOPTERUS ANTIQUORUM*) IN THE PUNJAB SALT RANGE.

In the Ibis for 1916 p. 115 I wrote that Captain Whitehead informs me that Flamingoes are common throughout the winter in the Salt Range Lake of Kallar Kahar. Although I did not visit the lake myself I had an opportunity of examining a skin obtained there and found it to belong to this species. I have now received through the kindness of a correspondent a fine adult male of this species shot at Kallar Kahar on 27th April 1923, and the heads and wings of a pair of immature birds shot at Uchali in the neighbouring district of Shahpur on 20th May 1923. The soft parts in these specimens have been carefully recorded as follows:—

Adult Male	..Iris light-yellow; eyelids french-grey; bill flesh colour, tip black, gape flesh colour; roof and edge of mouth dark-grey, legs bright coral-pink; nails black.
Mature Male	..Iris dark-brown; eyepatch dark-grey; bill light-greenish horn, tip black, lower half with a bluish tinge; legs grey flesh-tinge behind.
Immature female	..Similar but legs pinkish-grey.

Mr. H. W. Waite, Indian Police, who has an intimate acquaintance with the Kallar Kahar lake, informs me that he has seen Flamingoes on it in every month of the year. Their number vary but there are always more in the winter than in the summer.

It would be of interest if any member of the Society could furnish details of the Flamingo at the Uchali Lake or any other of the Salt Range Lakes.

DHARMSALA, PUNJAB, HUGH WHISTLER, F.Z.S.
7th July 1923. *Indian Police.*

No. XIII.—BIRDS ATTACKING A SNAKE.

On August 31st, whilst walking round a Tea Estate, I was attracted by the chattering and excited notes of several Passerine birds coming from the neighbourhood of a biggish tree, on the bank of a stream. I at once suspected a snake, and having arrived close to the tree, where some possibly 50 small birds were all wildly chattering and flying about, fairly high up, from branch to branch, I remained perfectly still. Having discovered where the birds were concentrating, I eventually made out the snake, about 2¼ feet long, hanging along and stretched over two or three small branches. From what I could see of it, it was of the genus *Dipsadomorphus*, probably *Dipsadomorphus ceylonensis*, Gunther's Catsnake. I counted 7 species of birds in the attack as follows:—

Small White-throated Babbler	*Dumetia a. albigularis.*
Purple Sun-bird	*Crytostomus zeylonicus.*
Madras Red-vented Bulbul	*Molpastes h. hæmorrhous.*
The White Browed Bulbul	*Pycnonotus luteolus.*
Indian White Eye	*Zosterops p. palpebrosa.*
Indian Grey Tit	*Parus major mahrattarum.*
The Common Indian Green Barbet	*Thereiceryx z. zeylonicus.*

The interesting part of the attack seemed to me to be that all the birds made direct assault on the head of the cat-snake, but none ever seemed to attack its long tail, which, hanging over the branch, appeared to be completely undefended, and open to a considerable amount of harrassing. The most persistent and venturous of the birds were the little Babblers, 4 in number, who were extraordinarily quick in their thrusts, and their wings also appeared to be used in the attack, just as a swan would use its wings. The little Sun-birds poised themselves in mid-air, directly in front of the snake's face, and every now and then darted in, though they rarely brought the attack right home. The White-Eyes were very numerous and very noisy, but perhaps The Madras Bulbuls seemed the noisiest of the lot, though beyond noise, they did not lend much actual support to the fight. The White-browed Bulbuls, a pair of them, contented themselves with out-bursts of chattering only, and flying up close to watch, and then back again to a safe distance. The Common Indian Barbet, possibly because he did not belong to the same order of the other birds, sat apart, and watched proceedings quietly. When the Cat-snake started to move, the noise grew in intensity, and it was rather interesting how the snake kept its balance slithering along the small branches, with such a babel of voices, and so many small assailants. This went on for the best part of three-quarters of an hour, till the Cat-snake eventually found itself right out at the end of a branch overhanging the stream, and it made me wonder, as it poised at the end of the leafy branch, if it was going to dive off into the water below, but not at all, it drew its tail gradually after it, and made itself apparently into a kind of big figure of 8, with an extra curve in it, and so remained, and thus I left it, with the noise of the attack still continuing. Having got into this position, the snake did not seem further to be particularly interested in the proceedings.

BALANGODA, CEYLON, GEORGE BROWN.
18*th September* 1923.

No. XV.—WOODCOCK IN THE NILGIRIS.

I see in the Journal No. 2, Vol. XXIX, Misc. Note No. XIX "Notes on Woodcock in the Nilgiris," Mr. Chas Inglis quotes letters, etc., about arrival of Woodcock.

I think it will be of interest to readers to know that I put up a woodcock on the Krurmand Mukerti Peak track, Nilgiris, on 28th April this year, which must be an exceptionally late date for this species to be found there. I asked my Shikari if he had seen woodcock at that time of the year and he said never before.

W. M. LOGAN HOME,
MAJOR.

No. XVI.—THE CORVIDÆ OF THE PUNJAB.

Reference Mr. Hugh Whistler's article on the Corvidæ of the Punjab in the current number of the Magazine, on page 161 the author states that he failed to find the jungle crow in the Rawalpindi plain. I saw one in Topi Park, Rawalpindi on the 3rd March this year. There was no chance of mistaken identification as the bird was very tame and hopped about the ride close to my horse.

RONALD T. FOSTER,
KULDANA, MURREE HILLS, MAJOR.
18*th June* 1923.

No XVII.—THE AFFINITIES OF *ERYX JACULUS AND ERYX JOHNI.*

Captain Ingoldby's suggestion in our last Journal (Vol. XXIX, p. 127) that *Eryx johni* does not deserve recognition as a species apart from *E. jaculus* has prompted me to refer to my notes on the specimens I have examined of both supposed species. I have for some years considered the two so closely allied that I have been guided largely by the locality of a specimen in identifying the species. In this Journal (Vol. XIX, p. 1,000). I identified a specimen from Jhelum as *jaculus,* the lepidosis being nearer to the description of this species in Boulenger's Catalogue (Vol. 1, p. 125) than that of *johni* (loc. cit. p. 127).

I think my records given below giving details of the lepidosis upon which the two supposed species are separated, strongly support Captain Ingoldby's view that *johni* should be rejected as a species apart from *jaculus.*

Serial No.	Costals.			Ventrals.	Subcaudals.	Locality.
	Two head-lengths behind head.	Midbody.	Two head-lengths before vent.			
1	51	57	37	190	26	Iraq. (Basra.)
2	48	53	37	190	24	Do. do.
3	42	49	37	190	33	Do. do.
4	47	52	35	198	27	Muhammerah, S Persia.
5	44	50	35	195	30	Do.
6	47	52	39	197?	26	Do.
7	45	51	37	190	28	Do.
8	48	54	39	199	25	Do
9	48	52	37	191	26	Do.
10	46	49	?	193	26	Do.
11	48	52	38	194?	26	Do.
12	47	53	41	190?	33	Baluchistan (Hanna).
13	42	47	34	199	33	Do. (Duki.)
14	44	51	38	200	29	Do. (do.)
15	45	53	38	195	35	Waziristan (Kaur bridge).
16	49	56	42	200	33	Do. (do).
17	46	51	37	193	34	Do. (Wana).
18	46	52	36	189	30	Punjab (Jhelum).
19	47	54	41	192	37	Do. (do.).
20	47	52	40	193	30	Do. (do.).
21	54	61	46	..	..	Do. (Mooltan).
22	44	52	40	190	28	Sind (Karachi)
23	47	52	41	193	29	Do. (do.).
24	39	48	53	192	34	Do. (do.).
25	51	59	42	201	31	Do. (do.).
26	49	58	42	198	34	Do. (do.).
27	54	60	41	215	30	Do. (do.).
28	52	62	45	213	..	S. India (Bangalore)

Colouration.—Captain Ingoldby says in the few young Indian specimens he has seen the body was quite unmarked. In young Sind specimens, however, and up to the time they are half grown, one sees ill-defined black bars on the body, more pronounced posteriorly.

I have never seen any specimens from Iraq and Persia that had acquired the uniform dark brown dorsal colouration so typical of the adult Indian form of the species, but immature Indian specimens resemble in colouration the specimens so typical of Iraq and Persia.

Dentition.—I have skulls of six Indian specimens that I have hitherto labelled *johni*, and two from Persia and Iraq identified as *jaculus*. A study of the teeth supports the view that they constitute a single species as will be seen from the following details.

Maxillary.		Palatine.	Pterygoid.	Mandibular.	LOCALITY.
Left ..	11	4	3	13	
Right ..	11	4	3	13	Trichinopoly.
Left ..	10	4	5	12	
Right ..	10	4	4	12	Karachi.
Left ..	10	4	4	?	
Right ..	10	4	4	?	Karachi.
Left ..	10	3	4	11	
Right ..	10	3	4	12	Jhelum.
Left ..	10	3	4	12	
Right ..	10	3	4	12	Jhelum.
Left ..	10	4	4	13	
Right ..	10	4	4	13	Jhelum.
Left ..	11	3	4	14	
Right ..	10	3	4	16	Muhammerah.
Left ..	10	3	4	11	
Right ..	9	3	4	11	Basra.

The *maxillary* series are anododont, syncranterian and scaphiodont. The *palatine* anododont, isodont. The *pterygoid* anododont, isodont. The *mandibular* anododont, strongly scaphiodont.

Distribution. The distribution of this snake is interesting as only one other species, *viz.*, *Echis carinatus* occurring in South India extends to Persia and Iraq.

KARACHI,
4*th August* 1923.

F. WALL,
COLONEL, I.M.S.

No. XVIII—AN UNUSUALLY LARGE *LABEO* FROM THE INDRAYANI RIVER.

The following incident, which may be of interest to fishermen in these parts occurred yesterday.

In company with Major and Mrs. T. W. Corbett, I had been out after green pigeon and was returning to Poona *via* the Nasik Road. On reaching the causeway over the river Indrayani we stopped for a smoke and to give the cars a drink. The water on the upstream side of the causeway was about a foot below road level and about five or six feet below the road on the lower side, with a series of small waterfalls rushing out from the sluices in the middle, the surface of each waterfall being only about 2 feet below the road. We noticed a number of small fish endeavouring to jump up through the sluices in their efforts to get upstream, many of them missing the sluices, which were about two feet wide, and striking the masonry at the side. We sat down on the edge of the causeway to watch them and then noticed a few big fish of several pounds weight moving in the water below, but these did not then appear to be making any efforts to surmount the waterfalls. One fish of about half a pound, however, actually struck the ankles of one of the party in his jump. Shortly afterwards a fine fish of 8 lbs. weight jumped clean on to the causeway and was secured after an exciting moment or so with the aid of the coat of one of the members of the party! He proved to be a fine specimen of "*Labeo fimbriatus,*' and I give the measurements and particulars below as he appears to be of unusual size according to 'Day' (F. B. I., Fishes, Vol. I, p. 258) who states that this fish only grows as a rule up to a foot and a half in length.

Weight 8 lbs; length 27″; girth 17½″; head 4¼″; tail 6″;

Scales. Lateral Line 44; 6 rows between L. l. and Ventral fin.

Dorsal fin 20 spines; anal 7; caudal 19;

2 small barbels on upper lip and 2 very minute on snout. Tail deeply forked, and the soft pad of the snout was spotted with small globules or pores.

I do **not** think there can be any doubt as to the fish being a specimen of *Labeo fimbriatus* as this is the only *Labeo* known in these parts having more than 15 spines in the dorsal fin or more than 40 scales in the Lateral line.

W. B. TREVENEN.

POONA, *September 3rd,* 1923.

No. XIX.—A NOTE ON SOME DISCREPANCIES IN FAUNA OF BRITISH INDIA, BUTTERFLIES.

When engaged in rearranging the collections of the Rhopalocera in the Forest Research Institute obtained from the following sources:—

Mr. P. Mackinnon (Mussoorie), Major Burn (Burma and Assam), Mr. A. E. Osmaston, I.F.S. (Naini Tal and Kumaon), Mr. T. R. D. Bell, I.F.S. (Karwar, Bombay) and Mr. O. C. Ollenbach (Dehra Dun).

The work by Col. Bingham was largely used, and I have noticed that the keys to the genera do not tally in all cases with the characters given for the species belonging thereto, as will be seen below:—

Keys as given in Fauna of British India. Vol. 1.	Characters actually found.
SATYRINÆ, p. 49. *b*2 YPTHIMA. Vs. 10 and 11 of forewing not free;	In *Y. huebneri*, *Y. indica*, *Y. asterope*, and *Y. nareda* vein 11 Starts from cell, veins 8-10 branching from V. 7.
Vs. 8-11 branching from 7.	In *Y. sakra* VII and V.7 spring from upper apex of cell.
NYMPHALINÆ, p. 204. B-*a* cell of both fore and hind wing closed.	In some specimens of *Cyrestis nivea* cells are not closed.
DOPHLA, p. 205. B-*a*5 Hindwing, veins 3 and 4 from lower apex of cell. b4 Forewing, veins"3 and 4 from lower apex of cell.	In *Dophla patala* veins 3 and 4 stalked and not from lower apex of cell.

AUZAKIA, p. 205.	
b5 Hindwing, veins 3 and 4 stalked branching beyond lower apex of cell.	Forewing veins 3 and 4 in some of examples of *Auzakia danava* stalked. Hindwing, veins 3 and 4 not stalked in some examples of *A. danava* and constantly non-stalked in *Cyrestis cocles*, and *Kallima* sp.
P. 206.	
B-b-b′-a4—Eyes hairy....LIMINITIS.	In *Liminitis trivena* eyes are not hairy.*
JUNONIA, p. 207 B.d.	
Cell of both fore and hind wing open	In some examples of *J. atlites* and *J. iphita* cell of forewing closed.
SEPHISA, p. 207, B-d-b1	
Forewing, vein 10 out of 7, not free.	In *Sephisa chandra* vein 10 comes out of the sub-costal.
Vol. II.	
PAPILIO, p. 11.	
A--b-a3.	
No conspicuous blue or green colouring or markings on upper side of wings.	The forewing of *Papilio telarchus* is richly glossed with blue.
PIERIDAE, p. 136.	
A-B-a6 Hindwing: precostal vein present.	Precostal vein in *Catopsilia* very rudimentary or absent.
TERIAS, p. 137.	
b6. Hindwing: precostal vein absent.	In *Terias* it is less prominent, but not wholly absent.
GONOPTERYX p. 137.	
A. 7. Hindwing, termen more or less acutely angulated at apex of vein 4.. (This is probably a printer's error.)	Hindwing, termen........angulated at apex of vein 3.
COLIAS, p. 137.	
b5. Forewing : vein 10 emitted from vein 7.	Forewing vein 10 in some examples of *Colias glycia* starts from cell.
LYCÆNINÆ, p. 305.	
A-a. Forewing : vein 11 anastomosed with V. 12.	Forewing V.7 not anastomosed with V.12 in *Zizera*.
CASTALIUS, p. 307.	
B. b2—eyes not hairy.	In *C. ethion*, *C. roxus*, and *C. decida* eyes are covered with fine hairs.
B a1—Veins 11 and12 anastomosed.	Veins 11 and 12 not anastomosed in *Tarucus*.

It will be seen that it is in the neuration that the anomalies chiefly exist, and in this connection attention may be drawn to the paper by Nathan Banks in the May number of the "Canadian Entomologist" of 1922 on the venational variation in *Raphdia*. He also notes that the wings were found in some cases to be asymetrical in neuration and similar asymetry has been noticed in some examples of *Rhopalocera* that have been examined by me.

FOREST RESEARCH INSTITUTE,
DEHRA DUN, *March* 1923.

S. N. CHATTERJEE,
Assistant to Systematic Entomologist.

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* In the specific table on p. 294 Col. Bingham states that *L. trivena* and *L. ligyes* have non hairy eyes. The latter species has not been seen by me.

PROCEEDINGS

OF THE MEETING HELD ON 19TH SEPTEMBER 1923.

A meeting of members of the Bombay Natural History Society and their friends was held in the Board room at the Prince of Wales Museum, Bombay, on Wednesday, the 19th September. The Revd. E. Blatter, S. J., presiding.

ELECTON OF MEMBERS.

The following 9 new members were elected since the last meeting:—The Head of the Department of Zoology, University of Amoy, China; Capt. B. Stuart Horner, Rajputana; Mr. H. C. O'Brien, Abadan; Mr. W. T. Palmes, I.C.S., Rangoon; Mr. D. Kydd, Bombay; Mr. C. Hunnybun, Nilgiris; Lt. H. R. Napier, Karachi; Mr. N. A. Tombazi, F. R. G. S., Bombay; The Director, King Institute, Madras.

APPOINTMENT OF NEW CURATOR.

The Honorary Secretary announced that the Committee had received advice from home of the resignation owing to ill-health of Mr. B. C. Ellison who had been Curator since November 1920. Mr. Ellison's health had been undermined by the attack of typhus he had whilst in a German prison camp and he had suffered badly from malaria whilst in India. He was sure that all members would join in wishing Mr. Ellison good health and prosperity in the new work he was taking up in England.

Members would be glad to hear that the Committee had decided to appoint Mr. S. H. Prater to the vacant post of Curator. The Honorary Secretary said he remembered Mr. Prater when he first joined the Society in 1907 as a boy fresh from St. Mary's School. He had had a long apprenticeship—he possessed natural gifts and, under the direction of Mr. Kinnear and Father Blatter, he learnt how to apply those gifts. It was not however Mr. Prater's natural gifts alone which had recommended him to the Committee. It was the knowledge, gained by observation of the work he had done, that in Mr. Prater the Society had a man they could rely on to give of his best—to serve the Society to the utmost of his power and to work for the good of the Society first and foremost. He asked the members to join with him in an expression of pleasure that Mr. Prater, who joined them as an inexperienced apprentice, had risen by merit to a post he was sure he had set his eye on from the time he had joined them.

Mr. Prater was heartily congratulated by those present and in reply said he would do his best to show that the Committee had made no mistake in their appointment and that he would try and express his thanks in serving the Society. Continning Mr. Prater said:—" Mr. Spence has chosen to say a number of nice things about me, but he has omitted to tell you what to me at least was the most important. If the work that I have done for the Society has met with any measure of success it was largely due to the continuous sympathy and encouragement I have received at his hands. My apprenticeship has been long but the way has been made easier by the privilege I have had of serving under a man whom I considered not only my employer but also a friend. I wish to thank Mr. Spence for all that he has done for me and to thank you all for your expression of confidence. It is my hope that the reliance that has been placed on me will be justified by my service to the Society and to Museum."

SNAKES OF BOMBAY.

Mr. S. H. Prater then read a paper on the Snakes of Bombay and Salsette, which will appear in full in the Journal. There was considerable interest shown in the subject, and more questions were asked the lecturer than is usually the case at our meetings.

The model plaster casts of snakes made in the Society's work rooms were found very useful in illustrating the lecture and were evidently appreciated by those present.

The meeting closed with a vote of thanks to the lecturer and to the Chair.

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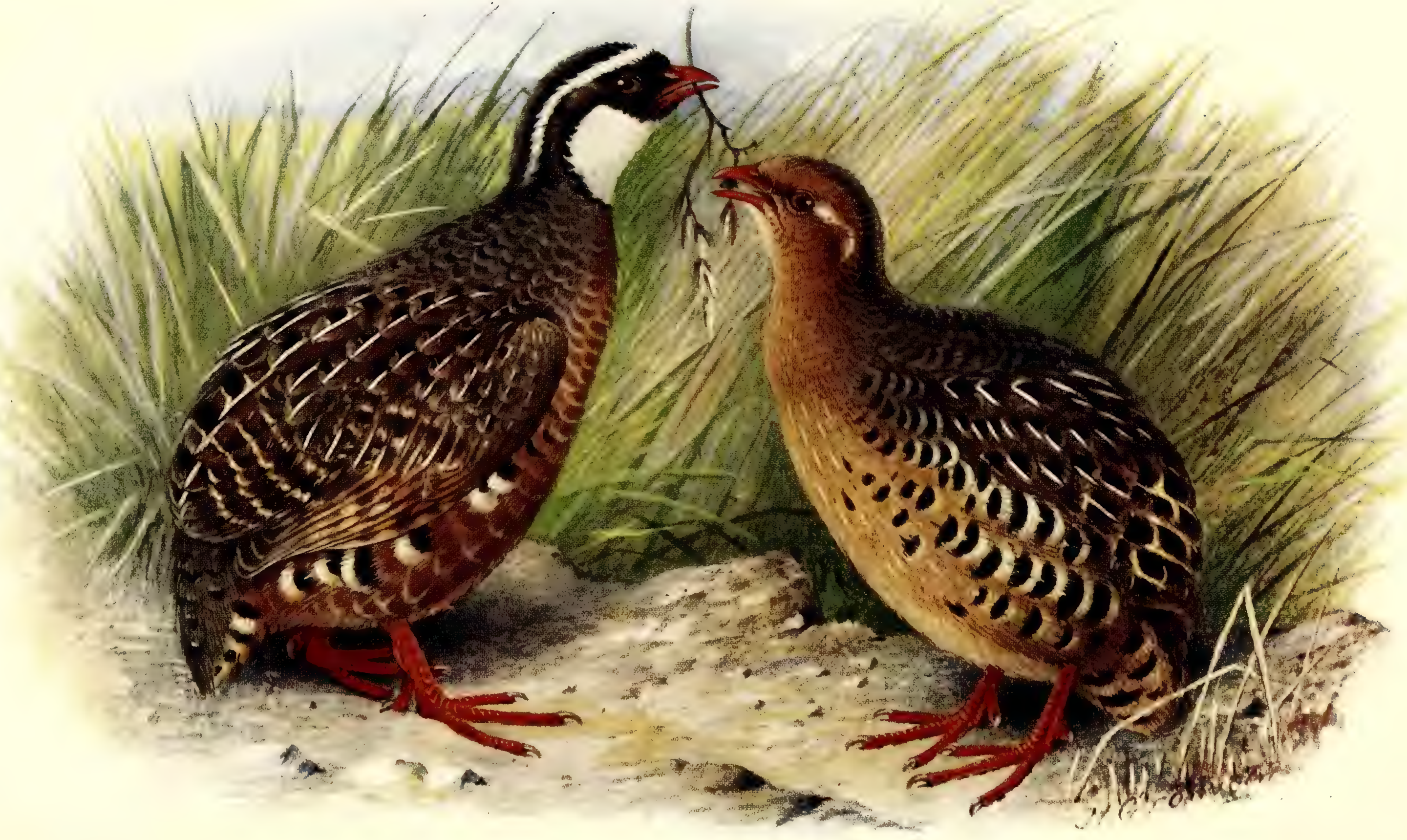
male
female

THE PAINTED BUSH-QUAIL
Microperdix e. erythrorhynchus.

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May 1924. Vol. XXIX. No. 4.

THE GAME BIRDS OF INDIA, BURMA AND CEYLON.

BY

E. C. Stuart Baker, F.L.S., F.Z.S., M.B.O.U., C.F.A.O.U.

Part XXXVII.

(*With a plate.*)

(*Continued from page* 597 *of this Volume.*)

Genus—CRYPTOPLECTRON.

Cryptoplectron Streubel, in Ersch. u. Gruber Allg. Encycl. 3, vol. 16, p. 291 (1842). Type *Coturnix erythrorhyncha,* Sykes.

The genus *Cryptoplectron* is very closely allied to *Perdicula,* but differs from that genus in many respects. The tail has only 10 feathers instead of 12 ; the tarsus is spurless ; the bill is decidedly longer and less high, and the wing is shorter and more rounded ; the first primary is equal to the 10th, and the 4th, 5th and 6th are sub-equal and longest.

There are only two species known and these are confined to India and possibly, the extreme North-West of Burma in the Chin Hills South of Manipur.

The name *Microperdix* Gould, (B. of A. vii, pl. iii, 1862) by which this genus has hitherto been generally known is unfortunately antedated by *Cryptoplectron,* 1842, and accordingly the latter name must be used.

Key to Species and Sub-Species.

A.—Upper surface brown with black spots.
  a. Throat white.
    *a*¹. Darker and larger ; wing 81 to 92 mm. .. .. *C. e. erythrorhynchus.* ♂ *p.*
    *b*¹. Paler and smaller ; wing 76 to 84 mm. .. .. *C. e. blewitti,* ♂ *p.*

b. Throat, chest and breast brick-red.
  c'. Darker and larger .. .. .. *C. e. erythrorhynchus,* ♀ *p.*
  d^1. Paler and smaller .. .. .. *C. e. blewitti,* ♀ *p.*
B.—Upper surface slaty grey with black bars and spots.
c. Throat chestnut.
  e^1. Upper surface boldly barred with black .. .. *C. m. manipurensis,* ♂ *p.*
  f^1. Upper surface with very little black marking .. .. *C. m. inglisi,* ♂ *p.*
d. Throat dark grey.
  g^1. Upper surface boldly marked with black .. .. *C. m. manipurensis,* ♀ *p.*
  h^1. Upper surface only faintly marked with black .. .. *C. m. inglisi,* ♀ *p.*

CRYPTOPLECTRON ERYTHRORHYNCHUS ERYTHRORHYNCHUS.

The Painted Bush Quail.

Coturnix erythrorhyncha Sykes, P.Z.S., 1832, p. 153, (Karli Valley, N. Konkan); Gray, Ill. Ind. Zool., II., pl. 44 (1834); Sykes, Trans. Z.S. II., p. 16, pl. I. (1841).

Perdix erythrorhyncha Blyth, J.A.S.B., XI., p. 808 (1842), (S. India).

Perdicula erythrorhyncha Bonpte., Comp. Rend., XLII., p. 881 (1856); Jerdon, B. of I. III., p. 584 (1863); Bnlger, P.Z.S., 1866, p. 571 (Nilgiris); Blyth, Ibis, 1867, p. 160; Blanf, ibid, 1867, p. 464, (*Sironcha*); Elwes, ibid, 1870, p. 528 (Cardamum Hills, Travancore); Fairbank, S. F. V., p. 409 (1877) (Palni Hills); David. & Wend., VII., p. 82 (1878), (Sholapur, Puna and Satara Hills).

Microperdix erythrorhyncha Gould, B. of A., VII., pl. 3 (1862); Hume, N. & Eggs, 1st ed., p. 548 (1873); Fairbank, S. F. IV., p. 262 (1876), (Khandala, Mahableswar).

Microperdix erythrorhynchus Hume & Marsh., Game-B., II., p. 123 (1879); Butler, S. F., IX., p. 428 (1880) (Bombay); id. Cat. B. S. Bombay, p. 69 (1880); Davis., S. F., X., p. 411 (1883), (Nilgiris, Mysore, Wynaad); Terry, ibid, X., p. 479 (1887), (Palni Hills); Oates, Hume's N. & E., III., p. 442 (1890); O-Grant, Cat. B. M., XXII., p. 203 (1893); id., Hand. B., Game-B. I., p. 156 (1895); Oates., Man. Game-B., I., p. 100 (1898); Blanf., Avifauna B. I., IV., p. 121 (1898); Davids., J. B. N. H. S., XII., p. 64 (1898), (N. Kanara); Oates, Cat. Eggs, B. M., I., p. 41 (1901); Bourdillon, Jour. B. N. H. S., XVI., p. 4 (1904), (Travancore); C. Primrose, ibid, XXIV., p. 597 (1916), (Nilgiris).

Cryptoplectron erythrorhynchus erythrorhynchus Stuart Baker, Hand-L. B. of I. E., p. 199 (1923).

Vernacular Names.—Kokni lowa, (Hind.) ; *Kadai,* (Tamil).

Description, Adult Male.—Forehead, lores, point of chin and round the eye black ; a broad band above the forehead and running back above the eye to the nape, white, sometimes spotted with black ; crown black, mixed to a varying degree with brown and always brown on the centre of the occiput; upper parts brown tinged with olive and with large velvety black subterminal spots to each feather ; scapulars, wing-coverts and innermost secondaries with white or creamy shaft-lines ; the coverts to the outer edge of the wing become more and more cross-barred with rufous ; the outer primaries are edged with rufous and the inner primaries barred with the same on the outer webs ; the bars become more definite on the secondaries extending across both webs ; tail feathers blackish brown, barred with rufous, the bars paler towards the tips ; posterior ear-coverts hair-brown ; anterior ear-coverts, cheeks, throat and sides of neck white surrounded by a narrow black band ; remainder of lower parts chestnut, the upper breast washed with the colour of the back and the feathers sub-tipped with small black spots ; sides of the breast, flanks and under tail-coverts with large subterminal blotches of black and with the feathers fringed with pure white.

Colours of Soft Parts.—Irides dull grey-brown, (probably in the young only) to brown, a light yellow-brown or hazel (in old birds only) ; bill, legs and feet rich red. Young birds have bill and legs a duller red, sometimes almost a brownish red.

Measurements.—Wing 81 to 92 mm. ; tail 38 to 49 mm. ; tarsus 25·5 to 27 mm.; culmen 14 to 16 mm. Nearly every specimen in the British Museum has a culmen full 15 mm. or over, but one bird from Travancore has it only 14 mm.

Female.—Head and throat with no black or white, these colours being replaced with dull rufous ; the black marks on the crown and back are much smaller ; the wings are marked with duller and paler rufous ; the breast is immaculate rufous, the blotches on the flanks are smaller and there is little or no white on these parts.

Colours of Soft Parts.—As in the male, but duller.

Measurements.—Wing 84 to 89 mm.

Chick in Down.—" Pretty little dark things with three stripes of a very light cream colour extending down their backs." (Miss Cockburn.)

Distribution.—South-West India from the South of Travancore Northwards as far as Poona. Eastwards this little quail only extends throughout the various hill ranges of Mysore, Nilgiris, Palni Hills, Cardamon Hills, the Wynaad and throughout the Western Ghats. There is a specimen in the British Museum labelled " Madras ".

Nidification.—This Little Quail breeds at all elevations throughout its range in suitable localities, that is to say, round about civilization, cultivation and open grassy land where there are also bushes and sufficient cover to hide the nests and eggs. Of nest there is really none at all, for the bird merely scratches a hollow in the ground under the shelter of a tuft of grass, a bush, or even under a clod, rock or boulder. It is apparently never placed in heavy cover of any kind whether tree forest, dense scrub or thick long grass. On the other hand it is occasionally placed practically in the open and not infrequently in among ferns, bushes and grass on the outskirts of gardens and compounds.

The number of eggs laid is not quite definite. Hume certainly accepted 10 as the full complement, and Darling, who was a reliable collector, says that he took as many as this in a clutch. Miss Cockburn gives the number as up to 14 but this may have been recorded merely on the strength of native assertions, notoriously unreliable. Probably 10 is the utmost number ever laid, and that only very exceptionally, the normal clutch being 5 to 7. I have tried for forty years, without avail, to obtain any certain record of anything over 7, and all the collectors who have been so kind as to help me have assured me that they have been unable to find any clutch more numerous than this.

The eggs are miniatures of those of the Grey Partridge, though they average broader in proportion. In colour they vary from almost white to a comparatively warm *cafè-au-lait* or buff, rarely with a faint olive tinge. They are never as white as are many eggs of *Perdicula* and never as deep a tint as some of the deepest eggs of *Francolinus*.

50 eggs average 31·0 × 23·0 mm. and the extremes are:—maxima, **34·3** × 24·0 mm. and 31·1 × **24·3** mm.; minima, **28·1** × 22·4 mm. and 31·0 × **22·0** mm.

It is difficult to define the breeding season; probably August to October are the favourite months, but in Travancore Bourdillon took eggs in January and February and again in July to September and in December; in the Nilgiris they breed from January to March again August to November and I have also 3 eggs taken at Kotagiri in June. These Quails certainly breed twice in the year but probably most birds breed according to the monsoons, laying after the first break of the rains when insect life is most plentiful and the young when hatched are easily fed.

There appears to be nothing on record as to the male Painted Bush Quail's domestic habits; whether he is polygamous or monogamous; what part, if any, he takes in incubation or looking after the young, etc. Judging from its pugnacity alone one would expect it to be polygamous, at the same time, as both parents are found with the coveys after they are hatched it is probable that it is monogamous.

Habits.—The Painted Bush Quail seems to be found wherever the ground is broken up into low foothills and ravines and from these up to at least 6,000 feet or higher. It is common in the plateaus at 2,000 feet when these are not too flat or too densely covered with forest but it is not found in the true plains countries. It resorts to thin scrub, light deciduous forest with scanty bush and grass undergrowth, but its favourite resorts are cultivated tracks interspersed with patches of cover and with others of open waste land. Mr. A. P. Kinloch records it as being very numerous in the Lily Downs in Cochin Nelliampatty at 4,700 feet, being found round the edge of every *shola*. He writes :—

> " These pretty birds are absurdly tame and seem even more deficient in intelligence than most Gallines. By sitting on a rock a few yards from the shola edge early in the mornings or late in the evenings and keeping still, I could repeatedly have knocked these birds over with a stick. They came within a couple of feet of my boots on one occasion."

In the mornings and evenings it wanders about in the open, often on roadsides, in gardens or in cultivated fields and, except when breeding, is found in little coveys of half-a-dozen to a dozen birds, evidently consisting of the old birds and their last brood, two families combining their forces in a few cases. In the heat of the day they seek shelter among bushes, grass or high crops and are then very hard to flush without a dog and, even with such help, they are very loth to rise again a second time.

They appear to be tame little birds and even when feeding in the open they will often run along in front of the disturber rather than take to wing, finally scuttling into the nearest cover when the danger comes too close.

Like the rest of our Indian Game-Birds, especially the more pugnacious ones such as this bird is, it suffers from the attentions of snarers and bird-catchers of all kinds. They are caught in the Nilgiris in basket traps as described by Miss Cockburn, who writes :—

> " The natives often rear these Quails as decoy birds. They make small square bamboo cages. In the centre is a small square compartment, in which the decoy bird (male or female) is confined. Little bars run from each corner of this inner compartment to the inner corner of the cage, thus dividing the space which runs all round the former into four verandahs, if I may use the word. The outer sides of these, in fact of the cage itself, let down, and are so arranged that, by the pressure of the bird's feet on the bars, which form the floor of the verandah, they start up again, and enclose whatever is in that particular verandah. Spring cages of this nature are in use, I believe, in many parts of India, though the arrangements for springing the sides vary a good deal.

> "The cage, the spring sides duly set, is placed on the ground in some locality where the wild birds are common. The owner hides himself behind a bush, and begins to imitate the bird's note by whistling like them. Instantly his own bird begins to call, and the wild ones all around answer it. In a few minutes these surround the cage, and rush into the verandahs to get at the decoy bird ; the spring sides fly up and close with a click, and the would-be combatants are captured. Hearing the sound, the Quail-catcher runs out, transfers the captured bird to his netted bag, re-sets the spring sides, and repeats the process."

Other methods she describes as follows :—

> "Sometimes, in addition to the spring cage, a small bamboo frame-work of varying length, and 3 or 4 inches in height, is placed upon the ground in a zigzag shape, partly or entirely surrounding the cage, and distant from it 2 or 3 feet. This little fence is pierced by numerous apertures (just large enough to allow the bird to pass), to each of which is attached a horse-hair noose. As this Quail prefers creeping through any hole to flying over any obstacle, however low, many which escape the spring cage are caught in the nooses.
>
> "When the natives come across a very young brood, they catch two or three of them, and put them into a hole about a foot deep, which they dig in the ground. The parent birds, finding that the young ones cannot come out to them, very soon drop into the hole, when the native, who has been watching from behind some bush, creeps softly up, throws a cloth over the hole, and captures them."

Their flight is like that of the ordinary Quail, very direct and straight but much less noisy. They rise at one's feet and whiz away in a bee-line from the intruder, and then tumble headlong into cover ; sometimes the whole covey rises all together, scattering in every direction, at other times they rise singly at intervals but eventually they all collect again together, calling continuously in a soft low whistle. Their ordinary call is a whistle which Davison syllabifies as tu-tu-tu-tu-tutu-tutu, etc., and which he says is very ventriloquistic, sometimes sounding far away and at other times as if almost at one's feet.

They feed on grain, seeds and small insects but the young are at first fed almost entirely on the latter. Although so tiny, they are by no means to be despised as an article of diet, their meat being very white and sweet if rather dry.

CRYPTOPLECTRON ERYTHRORHYNCHUS BLEWITTI.

Blewitt's Bush Quail.

Perdicula erythrorhyncha Ball (Nec. Sykes), Str. Feath., II., p. 428 (1874), (Chota Nagpur and Satpura Hills).

Microperdix blewitti Hume, S. F., II., p. 512 (1874), (Raipur); Ball, ibid, III., p. 294 (1875), (Chota Nagpur and Satpura Hills); Ball, ibid, VII., p. 225 (1878), (Sirguja, Raipur, Nowagarh and Karial); Hume & Marshall, Game-Birds Ind., II., p. 130, pl. (1879); Ogilvie-Grant, Cat. Birds B. M., XXII., p. 204 (1893); Ogilvie-Grant, Hand-B., Game-B. I., p. 158 (1895); Oates, Man. Game-B. India, I., p. 104 (1898); Blanf., Faun. Brit. Ind. IV., p. 122 (1898).

Cryptoplectron erythrorhynchus blewitti Stuart Baker, Hand-L. B. of I. E., p. 199 (1923).

Vernacular Names.—Sersee-lawa (Mundla, Balaghat, Chanda).

Description, Adult Male.—Similar to *M. e. erythrorhynchus*, but generally paler and duller; the black gorget round the white throat is very broken; the white sincipital line is broader, and the black forehead narrower; the brown-grey wash on the breast is stronger and comes lower down and there is more white on the feathers of the flanks.

Colours of Soft Parts.—"Iris brown; bill, legs and feet coral-red". (Hume).

Measurements.—Wing 76 to 84 mm.; tail 39 to 44 mm.; tarsus about 26 mm.; culmen 13 to 14 mm.

Female.—Differs in degree of colouration from that of the Painted Bush Quail as does the male.

Measurements.—Of the few sexed females available these are much the same as in the male.

Immature Birds are like the female but show considerable white shaft-lining, both on the breast and upper back. Young males soon acquire the black on the crown.

Distribution.—Central Provinces, North and East of the range of the preceding bird, having been found in Mandla, Balaghat, Seoni, Chandpur, Raipur, Sironcha and Bastar; it occurs round about the Sambalpur District on the East and thence North-East through Manbhum and Singbhum to Hazaribagh.

Nidification.—There is nothing on record about the nidification of this Quail, but 3 eggs sent me from Chanda in the Central Provinces as those of *C. e. erythrorhynchus* are undoubtedly those of this bird. They were taken on the 31st August 1889, and were said to have been laid in a scratching in thin Sal-tree and scrub jungle. Possibly on account of their age they are somewhat discoloured, but they certainly appear duller and are more olive-tinted than any eggs I have seen of the typical form. They measure 30·5×24·0; 32·0×23·0; and 30·0 × 23·4 mm. A series would probably differ from those of the Painted Bush Quail in averaging somewhat smaller. According to Mr. Blewitt (*vide infra*) the breeding season is from November to January, but Mr. R. Thompson says that the breeding season begins in June-July, and that young birds are on the wing by September. I twice came across this little Quail on the Ranchi District of Chota

Nagpore, and in both cases the coveys were of full-grown birds, but this was in May and June, possibly before they had begun to think of domestic duties.

Habits.—There has been absolutely nothing recorded about this Quail since the days of Hume and Marshall, when Blewitt wrote :

> "This really pretty Bush Quail is extensively distributed throughout the forest tracts and scrub jungle bordering the various low hill ranges in the districts of Raipur and Bhandára, and more sparsely in similar localities in the South-Western sections only of the Sambalpur District. I do not believe it exists in the other half, at least my men and I never secured a specimen. It also affects, at certain seasons, grass patches and fields near hills or jungle.
>
> "This Quail is invariably found associated in coveys of from four to a dozen, and even more. A bevy will, when suddenly alarmed, rise all together, but, owing to their softer plumage, with a less noisy whirr than the other Bush Quails. Indeed in its habits this species is identical with the others ; if there is a difference, it is in the call notes, which, in *M. blewitti,* is more soft and melodious. When feeding, chiefly in the early mornings and evenings, they run actively about, diligently searching for and picking up seeds of sorts and insects. From the statements of the villagers and others, the period of nidification would appear to be from November to January. It was some time in the former month or December that my men brought certain Quail eggs, which they positively stated to be of this species, but *without* the parent bird. There is, however, this fact to be noticed, that very young birds were shot and snared in February and March in the Raipur district. This Bush Quail is netted in great numbers in the cold and hot seasons. The flesh is very delicate and well flavoured."

The few birds we saw in Ranchi were in flocks of about 7 or 8 birds, and were put up, one flock out of a millet field, the other out of mixed Sal and scrub jungle which we were beating for Spur Fowl. My father bagged four birds out of the two flocks and I manfully missed the lot. The birds rose like Quail, one or two at a time, and not as Mr. R. Thompson says his did, *en masse.* They flew fast and straight, but not far, and tumbled down as if shot after flying for fifty to sixty yards, in fact they flew much as Common Quail fly but with a much softer *whirr.* They called a rather loud short whistle when rising and, after settling, again called to one another with a very soft, low little note.

Mr. Thompson says they soon become tame in captivity and make charming pets, but that the males are very pugnacious.

CRYPTOPLECTRON MANIPURENSIS MANIPURENSIS.

The Manipur Bush Quail.

Perdicula manipurensis Hume, S. F., IX., p. 467 (1880), (Bases of Eastern Manipur Hills); Hume, ibid, XI., p. 309 (1888).

Microperdix manipurensis Ogilvie-Grant, Cat. B. M., XXII., p. 204 (1893); id., Hand-B., Game-B. I., p. 159 (1895); Oates Man. Game-B. I., p. 107 (1898); Finn, Ibis, 1899, p. 472 (Manipur); Wood, J. A. S. B., LXVIII., pt. 2, p. 110 (1899), (Manipur); Connor, J. B. N. H. S., XVIII., p. 496 (1906); Higgins, ibid, XXII., p. 399 (1913), (Manipur).

Microperdix manipurensis manipurensis, Stuart Baker, Hand-L.B. of I. E. p. 200 (1923).

Vernacular Names.—Lanz-Soibol (Manipur).

Description, Adult Male.—Forehead, round the eye, cheeks, chin and throat deep rufous chestnut; lores, a line through the eye and a spot behind the ear-coverts white; ear-coverts brown; the whole upper plumage dark slaty-grey barred throughout with velvety black; the bars becoming bold black patches on the scapulars and inner secondaries: quills dark brown, the outer primaries edged with buff and the inner primaries and outer secondaries barred with the same; neck and upper breast ashy grey with black centres, lower breast and abdomen rufous buff, more grey on the flanks and each feather with a black cross formed by a black shaft line and broader cross bar; under tail-coverts black, tipped and spotted with white.

Colours of Soft Parts.—Iris dark brown or hazel; bill dark grey, paler and yellowish at the base; legs and feet orange red to deep vermilion red, probably darker and redder in the breeding season than at other times; claws light brown.

Measurements.—Wing 80 to 86 mm.; tail 45 to 52 mm.; tarsus about 25 to 26 mm.; culmen 14 to 15 mm.

Weight 2·28 to 2·65 ozs.

Female.—Like the male but duller and paler and without any chestnut on the head; the rufous below is replaced by pale greyish buff and the centre of the chin and throat is very pale grey.

Weight 2·37 to 2·94-ozs.

Distribution.—Manipur, Cachar, Naga Hills and Khasia Hills.

Nidification.—The only note recorded about the nesting of this bird is that of Captain H. S. Wood, quoted further on, given in the Journal of the Asiatic Society of Bengal, 1899, p. 110, but these eggs were probably those of a Bustard Quail. Once, however, I was so fortunate as to take their eggs myself.

On the 13th May 1899 whilst marching over the grass-covered hills on the Lere-Baladhun road in North Cachar one of these Quail rose from a patch of rather thin short grass, not more than a couple of feet high, almost at my feet. After bowling it over and picking it up I returned to my original position and hunted round on the off chance of a nest. A few minutes' search revealed to my delight four almost white eggs snugly ensconced in a hollow scratched in among the roots of the sun grass. There was no nest though a few scraps of grass and leaves lay scattered in the hollow where the eggs lay, points inward, as in the manner of Plover's eggs. These, the eggs, are whiter than any I have seen of *Cryptoplectron erythrorhynchus* and are not so pointed in shape. They measure 30·4 × 24·1 ; 31·2 × 23·5 ; 31·2 × 24·0 and 29·3 × 24·9 mm.

Habits.—There is so little on record about the Quail that I quote fully Hume's original note on his find. He writes :—

> " Once, and once only, did I meet with this species, and that was near the bases of the hills in the South-Eastern portion of the Manipur Plain.
>
> " There were two coveys—one of 6 and the other of 5—feeding in the very early morning in a tiny patch of ground a few yards square, thickly covered with large tufts of freshly springing elephant grass. This patch had recently been burnt ; probably it had been fired by design, but the fire had not spread, and all around for many hundreds of yards stretched a dense unbroken thicket of elephant grass, 15 feet high, and so thickly set that it was next to impossible to force one's way through it. I did not see the birds myself as I was a few yards to the right, but two of my people, on whom I could rely, saw them distinctly as they ran into the high grass, and described them to me as small blackish Partridges of an *unknown* kind.
>
> " There were about two square miles of high grass covering very uneven and broken ground, and it seemed hopeless to beat it, as we had no elephants and no dogs. So sending everyone away quietly, I ensconced myself in the high grass on the opposite side of the little opening to the place at which the birds had disappeared, and stood patiently waiting for about two hours. When it became too late to hope for their reappearance (this kind of bird rarely feeds in the open after 9 a.m.), I recalled my men and set to work to try and burn the grass, as a good breeze was blowing ; but after an hour thus wasted, we had to abandon the attempt. The fire would not spread, the grass was nearly dry, it had lost, I mean, all greenness, and nearly all natural moisture, but it had rained incessantly for the previous three days and nights and was still drizzling, and everything was too sodden to take fire. Naturally, I was not going to move until I did get a specimen, so my whole camp, soldiers and sailors (we had a lot of boatmen), camp followers, and all the inhabitants of the village were turned out. First we tried cutting, but it soon became obvious that this would be too long a job. So we set to work to divide off the expanse into a number of irregularly sized patches, and this the configuration of the ground with its several ridges, along the crests of which the grass

grew comparatively thinly, greatly facilitated. Although we had fully one hundred men working with their heavy hatchet-swords (*dahs* as the Burmese call them), and working, as only these Easterns can, at trace cutting, it was some hours before we had got the ground into shape, and fully three o'clock before beating commenced. At dusk, by dint of our united efforts, I had knocked over six, of which we had failed to retrieve one. The first bird had convinced me that the species was new to me, and what still more surprised me was that the villagers one and all denied having ever previously seen the bird. We were one and all exhausted with pushing through and through the thicket, and were so cut and scratched by the grass and bruised with stumbles in the broken ground that we were scarcely able to get back to our huts. But I had been very lucky. I had dropped every bird that rose, some of them very difficult shots. They had risen singly and at long intervals.

" Next day I let every one have a long sleep, a good breakfast and a good smoke, and by 10 a.m., we were again in the grass. By 3 o'clock I had knocked down five more, of which, however, we failed to find one. After that we saw no more, and I fully believe that there *were* only the two coveys of 6 and 5 respectively seen and counted by my people. I have had many hard days shooting in my life, but never any harder than these two.

" But what can we think of the bird ? Can it really have been a purely accidental straggler from further East ? Not only did the villagers of the place declare that they had never previously seen it, but the same was said in many other villages where I showed skins of it. Moreover, though I beat numbers of other seemingly suitable spots, I never saw another. On the other hand I never again had one-tenth of the number of men beating any patch of grass that I had on those two days, and no bird ever rose on that occasion until it chanced to get so hemmed in between half-dozen beaters that no other alternative remained to it, and about ten days after I shot my nine birds, one of my men saw and shot one in the early dawn just as it was retreating into a patch of grass, also at the foot of the Eastern Hills, but about 50 miles further North.

" I never heard it call, though certainly the birds go normally in coveys, and we separated the individuals composing these widely enough.

" Those killed had fed on grass seeds, pods of a tiny wild lentil, and ants of various colours. In one there were tiny black fragments that looked like portions of the wing-cases of some coleopterous insect."

Major Woods writes of this Quail :—

"During my seven years of residence in Manipur I must have shot over 80 birds of this species there. It is by no means such a rare bird as Hume thinks . . . . The Manipuri name for this bird is *Lanz-Soibol*, literally, the Trap Quail, as the Nagas snare this bird in nooses after the jungle fires. These birds breed in Manipur ; the egg as in all the Quail tribe is very large in proportion to the size of the bird, and is of a greenish colour, blotched with patches of brown and black. The nest is merely a hole scratched in the ground and there is no particular nest formation. I have only seen these birds at certain seasons of the year, during the rains and before the jungle fires. They keep to very dense jungle composed entirely of sun and elephant grass, and as they are great runners they are very hard to see. It is only after the jungle fires from February to April that one sees these birds in any quantity. They are always in coveys varying in number from 6 to 8. They are great runners and at first look like black rats running along the ground and are hard to see in the burnt grass the colour of which they so resemble. They will rise readily to dogs and after a short flight drop again into any patch of unburnt grass. I found them in greatest abundance in jungles adjoining nullahs in which there was a certain amount of water,—in fact they are always found close to water. Their call is a low whistle, soft in character, and this is heard chiefly in the evening after one has been firing the jungle, apparently a call for the assembly,. . . . . .I have never seen this bird in the low hills. They are associates of the Common Francolin and where one is found the other is also in the locality. When running they keep very close to each other ; in this way I have bagged as many as 4 in a single shot."

Mr. J. Higgins, C. S., also sends me the following interesting note on this Quail :—

"I bagged 88 Hume' s Bush Quail during the nine years I was in Manipur, 4 in the first five years and 84 in the last four when I had learnt more about their haunts. My best year produced 36 birds, and on my two best days I bagged 14 and 13 birds respectively, both days shooting in the same locality, at the foot of the hills on the East of the Imphal Valley, near where Col. Wilson got his Wood Snipe. They are to be found anywhere in the Manipur Valley where there is long grass and water, but almost exclusively round the edge of the valley, near the hills, and away from the populous portion of the country. They run in coveys up to a dozen and generally when first disturbed all rise together and then break up and scatter when it is difficult to flush them again, though they do not seem to run far. One day when shooting with Col. Cole we came on a piece of grazing ground and stream that was thick with different kinds of Quail and we shot 13 Blue-Breasted Quail, 4 Bustard Quail, 9 Hume's Quail and 2 *Turnix communis-japonica.* We were shooting with beaters and dogs, and one covey of Hume's Bush Quails furnished us with excellent sport. This particular covey instead of rising all in a bunch got up by ones and twos flying right across us so that we succeeded in shooting and picking up nine out of the whole covey of eleven.

" In the open they fly strongly and at a fair height, 6 or 8 feet off the ground. In long grass, however, or a jungly stream they soon drop and give rather difficult shots. I have not noticed them when running, so cannot say if they separate or keep together.

" The flesh of Hume's Bush Quail, which is distinctly a table bird and nearly as big as a Common Quail, is pure white throughout, and I consider it the best eating bird I know, better than Florican, Garganey Teal or Jungle-Fowl.

" I never saw it out of the Manipur Valley and its tributary valleys."

CRYPTOPLECTRON MANIPURENSIS INGLISI.

Primrose's Bush Quail.

Microperdix inglisi Ogilvie-Grant, Journal B. N. H. S., XIX., p. 1 (1909), (Goalpara, Assam); Inglis, ibid, pp. 2, 3; id., XIX., p. 993 (1910); id., ibid, XXVII., p. 151 (Jalpaiguri, Bengal).

Microperdix manipurensis Thornhill, Journal B. N. H. S., XV., p. 527 (1904), (Alipur Duars).

Microperdix manipurensis inglesi Stuart Baker, Hand L. B. of I. E. p. 200 (1923).

Vernacular Names.—*Kala Goondri* (Assamese).

Description, Adult Male.—Differs from *C. m. manipurensis* in being somewhat paler and less boldly marked with black both above and below.

Colours of Soft Parts.—" Bill dark grey, base of mandible lighter and in some specimens this is tinged with yellow; tarsus orange-red, toes and back of tarsus lighter, claws light brown. Iris brown." (C. M. Inglis).

Measurements.—The same as in *C. m. manipurensis.*

Female.—Differs from the female of *C. m. manipurensis* in being paler and more grey and in having the black markings smaller and less conspicuous.

Colours of Soft Parts.—As in the male.

Young.—Browner than the adult, but more heavily marked with black. Bill above dark grey, with pale tip and base to lower mandible; tarsus fleshy.

Distribution.—The foot hills and adjoining plains of the Eastern Duars, Jalpaiguri, through Assam North of the Brahmaputra as far East as Sadiya where a specimen was shot by Mr. J. Needham.

Nidification.—Unknown.

Habits.—This bird was first obtained by Thornhill in the Alipur Duars and identified as *M. manipurensis*. Later several were obtained by Mr. A. M. Primrose and Mr. Ch. M. Inglis, specimens being sent home by the latter which were named after him by Mr. Ogilvie-Grant.

Mr. Inglis thus writes about this little Quail:—

> "This Quail is the commonest quail got in that garden" (Mornai in Goalpara), " but on account of the nature of the jungle it frequents it is seldom seen and is difficult to get. They are found in damp, dense ekra jungle which grows in the nullahs, and when these get inundated during the rains, they move into higher pieces of ekra and also into the sungrass. We have never seen them on absolutely dry ground except when feeding; at other times they keep exclusively to the damp nullahs. Our observations are mostly confined to the cold weather, and up to April, as after that the jungle is too heavy to walk through or have beaten. They are excessively local birds, only certain patches of jungle holding them, and they frequent the same spot year after year. Although there may be, what appears to us, identical patches of ekra in the same nullahs and which one would think should contain these quails still none will be found in them. One soon gets to know which patches are worth beating and which not. Many of these birds must get destroyed in the fierce fires which rage in that part of Assam during the early part of the year. A good method of getting these birds is as follows:—
>
> " A day or two before the beat takes place burn patches in the nullah, leaving those which contain the birds. This has to be done carefully. This thinning of the jungle gives one a better chance, as it gives the birds fewer places to put up in when flushed and also fewer wounded birds get lost. Without doing this it is very difficult indeed to retrieve wounded birds as they run a lot and have a knack of getting over the ground at a good pace. A good dog or two would of course be of great service both for retrieving and putting up the birds. Burning the grass in front of one as one goes along is of no use, as the birds only run before or else through the fire and will not take to flight. They are usually seen in coveys of 4 to 6, but during March and April they collect into larger ones from 6 to 12 birds or perhaps even more. On the 28th March Mr. Primrose wrote that they were *exceedingly plentiful* and that he picked up 4 during one evening's stroll. The coveys separate on being disturbed, some flying ahead and others back over the beaters. They are not difficult to flush a second and even a third time with a sufficient quantity of good beaters. At first they rise up into the air and they go off with a straight, steady flight, for about 50 yards and then drop suddenly. This habit they have of thus

dropping often makes one believe one has missed one's bird instead of which it is probably stone dead where it fell, whereas those one thinks are killed have merely dropped and run away. On touching the ground they either start running at once or else if the beaters are close up they will squat. It is most difficult to spot them either running over or squatting upon the burnt grass, for their colour matches that of the ash most perfectly. When they squat they sit very closely being sometimes picked up alive by the beaters. Their note is like that of the Painted Bush Quail (*Microperdix erythrorhynchus*) and is often uttered when the covey separates. As far as we could observe, males outnumbered females. Their food consists principally of seed. They are very occasionally flushed from the edges of the tea. We on several occasions came upon coveys feeding in the open on the burnt ground up to about midday and probably during dull weather they feed there all day. With fair luck and straight powder, two men, one taking each side of the nullah, ought to be able to account for every bird in it. Our biggest bag for a morning was 8 birds, but that I am certain could be easily beaten in a place like Mornai. They are known by the name of *Kala goondri* at Mornai Tea Estate where all our specimens were obtained. Adults showed signs of breeding in the beginning of March, and we were fortunate enough to obtain a fully fledged young one on the 11th January."

(To be continued.)

A HAND-LIST OF THE SNAKES OF THE INDIAN EMPIRE.

By

F. Wall, C.M.G., C.M.Z.S., F.L.S., F.A.S.B., H.C.Z.S.I.,
Colonel, I.M.S.

(Continued from page 632 of this Volume.)

Part III.

Family.—COLUBRIDÆ—*(Continued.)*

Subfamily.—COLUBRINÆ.

205 (368) **Liopeltis scriptus** (Theobald.) *Theobald's Smooth Snake.*

Ablabes scriptus. *Boulenger, Cat. Vol II,* 1894, *p* 284 ; *Sclater List Sn. Ind. Mus.,* 1891, *p* 18.

Type.—In the Indian Museum from Martaban.

Length.—451 mm. (1 foot, 5⅝ inches). Tail, 145 mm. (5¾ inches).

Lepid.—Costals. In 13 rows in the whole body length. Ventrals. 146. Anal. Divided. Subcaudals. 88.

Distn.—Burma. Martaban.

Note.—Malcolm-Smith's authority for the Malay Peninsula. North of Kra, is not known to me.

206. (*Nil.*) **Liopeltis stoliczkæ** (Sclater.) *Stolizcka's Smooth Snake.*

Ablabes stoliczkæ *Boulenger, Cat. Vol II,* 1894, *p* 281 ; *Sclater, List Sn. Ind. Mus.* 1891, *p* 18 ; *Wall, Bomb. N. H. J. Vol XIX, p* 350.

Lepid.—Ventrals. 148 to 154.

Distn.—Eastern Himalayas. Sikkim. (Darjeeling Dist. F. W. Mungpoo. Bombay colln.) *Assam.* Naga Hills. (Samaguting. Ind. Mus.) *Burma,* Karen Hills (Bia-po.)

207. (370) **Liopeltis doriæ** (Boulenger.) *Doria's Smooth Snake.*

Ablabes doriæ *Boulenger, Cat. Vol II,* 1894, *p* 279 ; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 18.

Lepid.—Ventrals. 160 ? to 187. Subcaudals. 74 to 80.

Distn.—Assam. (Boulenger.) *Burma.* Kachin Hills. Manipur. (Ind. Mus.) *China.* Yangtse Valley (F. W.).

208. (369) **Liopeltis frenatus** (Günther.) *Jerdon's Smooth Snake.*

Ablabes frenatus *Annandale, Rec. Ind. Mus.* 1912, *pp* 37, 47 *and* 53; *Boulenger, Cat. Vol II,* 1894, *p* 280; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 18; *Wall, Bomb. N. H. J. Vol XVIII, p* 328.

Lepid.—Subcaudals. 87 to 97.

Distn.—Assam. Abor Hills. Khasi Hills. *Burma.* Mansi. (Lat. 24·7°. Long. 95·7°. Bombay colln.)

Note.—Boulenger has already questioned the authenticity of the localities of specimens labelled Afghanistan and Mesopotamia in the British Museum. Murray refers to a specimen from Sind. (Vert. Zool. Sind. 1884, p 376.) The specimen was not in the Quetta

Museum when I examined the collection nor in the Karachi Museum. This collection includes snakes from many parts of India, such as *Plectrurus perroteti, Silybura ocellata, Cylindrophis rufus,* etc. Sind is to be discredited. I have seen one specimen in the Indian Museum from Assam, and acquired six, three from Shillong, and three from Cherrapunji.

209. (367) **Liopeltis calamaria** (Günther.) *Günther's Smooth Snake.*

Ablabes calamaria. *Boulenger, Cat. Vol II,* 1894, *p* 282 ; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 18; *Ferguson, Bomb. N. H. J. Vol XIV, p* 386 ; *Pearless, Spol. Zeylan.* 1909, *p* 54 ; *Sarasin, Zool. Jahr. Jena.* 1910, *p* 128 ; *Wall, Bomb. N. H. J. Vol XXVI, p* 569; *Willey, Spol. Zeylan.* 1906, *p* 233.

Liopeltis calamaria. *Wall, Oph. Tap.* 1921, *p* 251.

Lepid.—Ventrals. 126 to 163. Subcaudals. 53 to 76.

Distn.—*Eastern Himalayas.* Buxa Dooars. (Bombay colln.). *Western Himalayas.* Songara, Gonda Dist. Kurkhana, Pilibhit Dist. Melanghat, Almora Dist. (Ind. Mus.) *Hills of Peninsular India.* Surguja, Chota Nagpur Dist. (Ind. Mus.) Western Ghats. (Mahableshwar, Bombay colln. Mysore Plateau. F. W. Tinnevelly. Ind. Mus.) *Ceylon.*

210. (371) **Liopeltis rappi** (Günther.) *Rapp's Smooth Snake.*

Ablabes rappi. *Boulenger, Cat. Vol II,* 1894, *p* 282 ; *Sclater, List. S. Ind. Mus.* 1891, *p* 19; *Sarasin, Zool. Jahr. Jena.* 1910, *p* 146 ; *Wall, Bomb. N. H. J. Vol XIX, p* 351.

Lepid.—Subcaudals. 60 to 76.

Distn.—*Western Himalayas.* Simla. (Ind. Mus.) *Eastern Himalayas.* Nepal to Sikkim.

211. (*Nil.*) **Liopeltis hamptoni** (Boulenger.) *Hampton's Smooth Snake.*

Ablabes hamptoni. *Boulenger, Bomb. N. H. J. Vol XIII, p* 553.

Type.—From Mogok, in the British Museum.

Length.—1,050 mm. (3 feet, 5⅜ inches). Tail, 220 mm. (8¾ inches).

Lepid.—Costals. In 15 rows at midbody. Ventrals. 194. Anal. Entire. Subcaudals. 76.

Distn.—*Burma.* Mogok, Ruby Mines.

212. (372) **Liopeltis nicobariensis** (Stoliczka.) *The Nicobar Smooth Snake*

Ablabes nicobariensis. *Annandale, J.A. S., Beng.,* 1905, *p* 175; *Boulenger, Cat. Vol II,* 1894, *p* 285 ; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 19.

Type.—In the Indian Museum from Camorta.

Lepid.—Ventrals. 188 on right side, 186 on left. Subcaudals. 86.

Distn.—*Nicobar Islands.* Camorta. (No 7201. Ind. Mus.)

Genus.—CALAMARIA *Boie.*

213. (332) **Calamaria pavimentata** Dumeril and Bibron. *Dumeril's Snake.*

Boulenger, Cat. Vol II, 1894, *p* 348; *Prater, Bomb. N. H. J. Vol XXVI, p* 684 ; *Wall, Bomb. N. H. J. Vol XXVI, p* 866.

Lepid.—Ventrals. 140 to 200.

Distn.—*Assam.* Garo Hills. (Tura. Bombay colln.) *Burma.* Chin-Hills. Pegu. (? Hills.) *Siam. Indo-China.* Lao Hills. *China.* Canton. Yangtse Valley. *Malay Peninsula.* Penang Hill. Pahang. Perak. Prov. Wellesley. *Malay Archipelago.* Java.

Series.—OPISTHOGLYPHA.

Sub-family.—HOMALOPSINÆ.

Genus—HYPSIRHINA *Wagler.*

214. (466) **Hypsirhina plumbea** (Boie.) *Boie's Water Snake.*

Hypsirhina plumbea. *Boulenger, Cat. Vol III,* 1896, *p* 5 ; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 54.

Lepid.—Ventrals. 117 to 139.

Distn.—Burma. Mandalay. (Stoliczka.) Pyawbwe and Rangoon (Bombay colln.) Thayetmyo. (Theobald.) Meiktila. (F. W.) *Siam.* Patani. Pachebone. *Indo-China. China.* Southern Provinces and Coastal Islands. *Formosa. Malay Peninsula.* Penang. Tahkamen. *Malay Archipelago.* Java. Borneo. Celebes.

215. (467) **Hypsirhina enhydris** (Schneider.) *Schneider's Water Snake.*

Helicops indicus. *Annandale, J. A. S., Beng.,* 1905, *p* 211.

Hypsirhina enhydris. *Boulenger, Cat. Vol III,* 1896, *p* 6 ; *D'Abreu, Bomb. N. H. J. Vol XXII, p* 203 ; *Sarasin, Zool. Jahr. Jena.* 1910, *p* 131 ; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 54 ; *Wall and Evans, Bomb. N. H. J. Vol XIII, pp* 348 *and* 616 ; *Wall, Bomb. N. H. J. Vol XIX, p* 831 ; *l. c. Vol XXI, p* 1017.

Length.—972 mm. (3 feet, 2¼ inches). (Captain Frere in a private letter, dated July 1911. Locality, Minbu. Burma.)

Distn.—Peninsular India. North-East litoral, North of the Godavery River. Anakapalle, Vizagapatam. (Russell.) *Orissa.* Berhampore. (F. W.) Puri. Kendrapara. (Ind. Mus.) *Bengal.* Manbhum, Calcutta, and Sunderbunds. (Ind. Mus.) Burdwan. (D'Abreu in private letter.) Behar. Darbhanga. Siripur. (Ind. Mus.). Gonda, Oudh. (Bombay colln.) Patna. (D'Abreu in private letter.) Jalpaiguri. (F. W.) *Assam.* Goalpara and Cachar. (Ind. Mus.) Dibrugarh. (F. W.) *Burma.* From Mandalay (Ind. Mus.) in the North, to Tavoy (Ind. Mus.) in the South. *Siam.* Bangkok. (Bombay colln.) Patani. *Cochin-China. China.* Southern Provinces and Coastal Islands. *Malay Peninsula.* Kedah. Penang. Singapore. *Malay Archipelago* Borneo.

Note.—Both Flower and Boulenger mention Ceylon within its habitat but I can find no authority for this. Possibly it has been confused with *Helicops schistosus,* a mistake I have discovered in examining various collections.

216. (468) **Hypsirhina blanfordi** Boulenger. *Blanford's Water Snake.*

Boulenger, Cat. Vol III, 1896, *p* 10 ; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 55.

Type.—In the Indian Museum. Locality dubious.

Lepid.—Ventrals. 122 to 125. Subcaudals. 33 to 45.

Distn.—Burma. Pegu. (Blanford.) Bassein ? (Sclater.)

217. (469) **Hypsirhina sieboldi** (Schlegel). *Siebold's Water Snake.*

"*New Homalopsid.*" *Dreckman, Bomb. N. H. J. Vol I, p* 24.

Ferania sieboldi. *Murray, Bomb. N. H. J. Vol I, p* 219.

Hypsirhina sieboldi. *Boulenger, Cat. Vol III,* 1896, *p* 11 ; *Sarasin, Zool. Jahr. Jena.* 1910, *p* 144; *Wall, Bomb. N. H. J. Vol XI, p* 732; *l. c. Vol XVIII, pp* 118 *and* 920.

Length.—775 mm. (2 feet, 6½ inches).

Lepid.—Costals. In 27 to 33 rows. Ventrals. 143 to 158. Subcaudals. 43 to 56.

Distn.—Peninsular India. Malabar Coast. Travancore. (F. W.) Bombay. (Brit. Mus.) *Ganges River System.* Delhi. (F. W.) Agra. (Ind. Mus.). Saugor. (Bombay colln.) Fyzabad. (F. W.) Champaran. (F. W.) Patna. (D'Abreu in private letter.) Monghyr. Purneah. (Ind. Mus.) Pusa. (Bombay colln.). *Brahmaputra River.* Samaguting. (Ind. Mus.) Mymensingh. (Bombay colln.). *Rangoon River.* Pegu. (Ind. Mus.)

Note.—I discredit Penang on Cantor's authority for reasons cited in the note to *Typhlops bothriorhynchus.*

Genus.—HOMALOPSIS *Kuhl.*

218. (464) **Homalopsis buccata** (Linnè.) *Linné's Water Snake.*

Boulenger, Cat. Vol III, 1896, *p* 14 ; *Sclater, List Sn. Ind. Mus.* 1891, *p* 53.

Wall and Evans, Bomb. N. H. J. Vol XIII, pp 349 *and* 616; *Wall, Bomb. N. H. J. Vol XVI, p* 388.

Length.—1,310 mm. (4 feet, 3½ inches).

Lepid.—Ventrals. 157 to 173. Subcaudals. 65 to 106.

Distn.—Burma. Lower reaches of the Bassein, Rangoon and Moulmein Rivers, and adjacent tanks. *Siam. Indo-China. Malay Peninsula. Malay Archipelago.* Sumatra. Java. Borneo.

Genus.—HURRIA *Daudin.*

1799 Hydrus. *Schneider, part. Hist. Amph. I, p* 246 [*type. H. platurus* (*Linné*)].
1801 Elaps. *Schneider, part. Hist. Amph. II, p* 301 [*type E. marcgravi* (*Wied*)].
1803 Hurria. *Daudin, Hist. Nat. Rept. V, p* 281 [*type H. bilineata*=*H. rhynchops* (*Schneider*)].
1803 Coluber. (*non Linné,* 1766.) *Daudin, Hist. Nat. Rept. VII, p* 167.
1820 Python. (*non Daudin,* 1803.) *Merrem, Tent. Syst. Amph., p* 89.
1826 Homalopsis. (*non Kuhl,* 1822) *Fitzinger, N. Class Rept., p* 55.
1829 Cerberus. *Cuvier, Regne. Anim. II, p* 81 [*type Coluber cerberus*=*H. rhynchops* (*Schneider*)].

219. (465) **Hurria rhynchops** (Schneider.) *The Dog-faced Water Snake.*

Cerberus bœformis. *Blyth, And. Islanders, pp* 365 *and* 366.

Cerberus rhynchops. *Alcock and Rogers, Proc. Roy. Soc.,* 1902, *p* 449 ; *Annandale, J. A. S.* 1905, *p* 176 ; *Mem. Ind. Mus.* 1915, *p* 170 ; *Boulenger, Cat. Vol III,* 1896, *p* 16 ; *Ferguson, Bomb. N. H. J. Vol X, p* 74 ; "*Keswal,*" *Bomb. N. H. J. Vol I, p* 173 ; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 54 ; *Sarasin, Zool. Jahr. Jena.* 1910, *p* 131 ; *Wall and Evans, Bomb. N. H. J. Vol XIII, pp.* 345 *and* 612 ; *Wall, Bomb. N. H. J. Vol XVI, p* 307 ; *l.c.* 1919, *p* 89.

Hurria rhynchops. *Wall, Oph. Tap.* 1921, *p* 257.

Length.—991 mm. (3 feet, 3 inches).

Lepid.—Ventrals. 122 to 160.

Distn.—Coasts and tidal Rivers from Bombay to Indo-China. *Ceylon. Andamans. Nicobars. Malay Archipelago.* Sumatra to Celebes. *Philippines. Formosa.*

Note.—One was brought to me in Bangalore on the 22nd of July 1920 by a snakeman, who tried to convince me he had procured it locally He eventually confessed that he had captured it on the West Coast. "Nilgiris" as the locality of a specimen in the British Museum presented by Mr. Theobald may be similarly explained. In every case where a snake has been acquired through snakemen the fact should be recorded.

Genus—GERARDIA *Gray.*

220. (471) **Gerardia prevostiana** (Eydoux and Gervais.) *Gerard's Water Snake.*

Boulenger, Cat. Vol III, 1896, *p* 20; *Phipson, Bomb. N. H. J. Vol IX, p* 486; *Wall and Evans, Bomb. N. H. J. Vol XIII, p* 616; *Wall, Bomb. N. H. J. Vol XVI, p* 307; *Oph. Tap.* 1921, *p* 262.

Lepid.—Ventrals. 145 to 156. Subcaudals. 29 to 36.

Distn.—Coasts and Rivers of India. Alibag. (Bombay colln.) Bandora. (Brit. Mus.) Cannanore. (F. W.) *Burma.* Rangoon. (F. W.) Pegu. (Brit. Mus.) Amherst. (Ind. Mus.) *Ceylon.* Kelani River.

Note.—The Ceylon record, though disputed, is on the authority of Ferguson, a thoroughly reliable observer. Further I found a specimen labelled Kelani River in the Colombo Museum obviously the one referred to by that authority.

Genus.—FORDONIA *Gray.*

221. (470) **Fordonia leucobalia** (Schlegel.) *Fordon's Water Snake.*

Annandale, J. A. S., Beng., 1905, *p* 176; *Boulenger, Cat. Vol III,* 1896, *p* 21; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 55; *Wall and Evans. Bomb. N. H. J. Vol XIII, p* 347.

Distn.—Rivers and Coasts from the Sunderbunds to Cochin-China. Bengal. Sunderbunds. (Ind. Mus.) *Burma.* Rangoon. (Theobald.) Watya. (Wall and Evans.) Moulmein. (Bombay colln.) *Nicobars, Cochin-China. Malay Peninsula.* Singapore. Penang. *Malay Archipelago.* Java. Borneo. Ceram. *New Guinea. North Australia.*

Genus.—CANTORIA *Girard.*

222. (472) **Cantoria violacea** Girard. *Cantor's Water Snake.*

Boulenger, Cat. Vol III, 1896, *p* 23; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 55; *Wall and Evans, Bomb. N. H. J. Vol XIII, p* 611; *Wall, Bomb. N. H. J. Vol XXIII, p* 126.

Length.—1,220 mm. (4 feet).

Lepid.—Ventrals. 241 to 284. Subcaudals. 52 to 69.

Distn.—Rivers of Burma. Irrawadi. (Wakema.) Moulmein. Amherst. *Andamans* (F. W.) *Malay Peninsula.* Singapore. *Malay Archipelago.* Borneo.

Genus.—HIPISTES *Gray.*

223. (473) **Hipistes hydrinus** (Cantor.) *Gray's Water Snake.*

Boulenger, Cat. Vol III, 1896, *p* 24; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 56; *Wall and Evans, Bomb. N. H. J. Vol XIII, pp* 347 *and* 616,

Lepid.—Ventrals. 153 to 172. Subcaudals. 21 to 35.

Distn.—Coasts and tidal rivers of Burma. Rangoon River. (Watiya. Rangoon. Pegu.) Thaton. Moulmein. Amherst. Mergui. *Malay Peninsula.* Selangor, Penang. Kedah. Singapore. *Siam.* Bangkok.

Genus.—TARBOPHIS *Fleischmann.*

224. (*Nil*) **Tarbophis rhinopoma** (Blanford.) *Blanford's Cat Snake.*

Dipsas rhinopoma. *Blanford, Ann. and Mag. N. H.* (4) *XIV,* 1874, *p* 34; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 48.

Dipsadomorphus jollyi. *Wall, Bomb. N. H. J. Vol XXIII, p* 167.

Tarbophis rhinopoma. *Boulenger, Bomb. N. H. J. Vol IX, p* 325 ; *Cat. Vol III,* 1896, *p* 50.

Type.—From Karman. In the Indian Museum.

Lepid.—Costals. In 21 to 25 rows to behind midbody, reducing to 17 before the vent. Ventrals. 247 to 280. Anal. Entire. Subcaudals. 76 to 99.

Distn.—*Sind. Baluchistan.* Kacha Thana. Miranshah, Tochi Valley. *Persia.*

DIPSADOMORPHUS *Fitzinger.*

1827 Dipsas. (*non Laurenti*, 1768.) *Boie, part Isis, p* 548.

1843 Dipsadomorphus. *Fitzinger, Syst. Rept., p* 27 [*type D trigonatus* (*Schneider*)].

225. (448) **Dipsadomorphus multimaculatus** (Boie.) *The Argus Cat Snake.*

Dipsas multimaculatus. *Boulenger, Faun. Brit. Ind. Rept.*, 1890, *p* 360 ; *Sclater, List. Sn. Ind. Mus.*, 1891, *p* 46.

Dipsadomorphus multimaculatus. *Annandale, J. A. S., Beng.*, 1904, *p* 210 ; *Boulenger, Cat. Vol III,* 1896, *p* 63 ; *Wall and Evans, Bomb. N. H. J. Vol XIII, pp* 346 *and* 615 ; *Wall, Bomb. N. H. J. Vol XIII, p* 534 ; *l. c. Vol XXV, p* 525.

Length.—997 mm. (3 feet, 3¼ inches).

Lepid.—Costals. In 19 rows to behind midbody, 15 two heads-lengths before the vent. Ventrals. 202 to 245. Subcaudals. 80 to 111.

Distn.—*Eastern Bengal.* Chittagong. (F. W.) *Burma.* As far North as Mandalay. (Bombay colln.), and South to Moulmein. Shan States. *Siam.* Pachebon. Pitsanuloke. Sanam Cheng. Bangkok. *Indo-China. China.* Southern Provinces and Coastal Islands. Fumun. Canton. Hongkong. *Malay Peninsula* ? Penang. (Cantor.) *Malay Archipelago.* Sumatra. Java. Celebes.

Note.—I attach a query to the Malay Peninsula for reasons cited in the note to *Natrix parallelus.* Cantor appears to be the only authority for this locality.

226. (445) **Dipsadomorphus barnesi** (Günther.) *Barnes's Cat Snake.*

Dipsas barnesi. *Abercromby, Sn. of Ceylon,* 1910, *pp* 47 *and* 78 ; *Spol. Zeylan.* 1911, *p* 206 ; *Boulenger, Faun. Brit. Ind. Rept.* 1890, *p* 359 ; *Willey, Spol. Zeylan.* 1903, *p* 81 ; *l. c.* 1906, *p* 233.

Dipsadomorphus barnesi. *Boulenger, Cat. Vol III,* 1896, *p* 73 ; *Sarasin, Zool. Jahr. Jena.* 1910, *p* 127 ; *Wall, Oph. Tap.* 1921, *p* 283.

Lepid.—Costals. In 19 rows to behind midbody, reducing to 15 two heads-lengths before the vent. Ventrals. 208 to 220. Subcaudals. 99.

Distn.—*Ceylon.* Gangaruwa.

Note.—I have examined the type, and the only other known specimen in the Colombo Museum.

227. (*Nil.*) **Dipsadomorphus quincunciatus** Wall. *Wall's Cat Snake.*

Wall, Bomb. N. H. J. Vol XVIII, p 272 ; *l. c. Vol XIX, p* 833.

Type.—In the British Museum from Tinsukia near Dibrugarh, Assam.

Length.—1,055 mm. (3 feet, 5½ inches).

Lepid.—Costals. In 19 rows to behind midbody, 15 two heads-lengths before the vent. Ventrals. 237 to 242. Anal. Divided. Subcaudals. 118.

Distn.—Assam. Tinsukia and Rangagara, both near Dibrugarh.

Notes.—I have seen two examples the only ones known.

228. (446) **Dipsadomorphus ceylonensis** Günther. *Günther's Cat Snake.*

Dipsas ceylonensis, *Abercromby, Sn. of Ceylon,* 1901, *pp* 49 *and* 77 ; *Spol. Zeylan.* 1911, *pp* 205 *and* 207 ; *Ferguson, Bomb. N. H. J Vol X, p* 73 ; *Pearless, Spol. Zeylan.* 1909, *p* 54 ; *Willey, Spol. Zeylan.* 1903, *p* 82.

Dipsadomorphus ceylonensis. *Boulenger, Cat. Vol III,* 1896, *p* 66 *(part.)* ; *Wall, Rec. Ind. Mus.* 1909, *p* 152 ; *Bomb. N. H. J. Vol XXVI, p* 570 ; *Oph. Tap.* 1921, *p* 278.

Length.—1,283 mm. (4 feet, 2½ inches).

Lepid.—Costals. In 19 rows to behind midbody, 13 or 15 two heads-lengths before vent. Ventrals. 214 to 235. Subcaudals. 91 to 111.

Distn.—Western Ghats. From Matheran to Travancore. *Ceylon.* Hills of Central and Sabaragamuwa Provinces.

Note.—Has been confused with *beddomei, nuchalis,* and *andamanensis.* I have examined 82 examples. Annandale (Rec. Ind. Mus. 1909, p 281) contests my view that these four "forms" are entitled to rank as species, and I expect many others to accept his view in opposition to mine, which I adhere to. In the circumstances it is open to those who agree with Annandale to relegate *beddomei, nuchalis,* and *andamanensis* to the rank of varieties of *ceylonensis.*

229. (446) **Dipsadomorphus beddomei** Wall. *Beddome's Cat Snake.*

Dipsas ceylonensis. *Abercromby, Spol. Zeylan.* 1911, *pp* 205 *and* 207, *Boulenger, Faun. Brit. Ind. Rept.* 1890 ; *p* 359 (*part*); *Ferguson, Bomb. N. H. J. Vol X,* 1895, *p* 73 ; *Willey, Spol. Zeylan.* 1903 *p* 82.

Dipsadomorphus ceylonensis. *Boulenger, Cat. Vol III,* 1896, *p* 66 (*part*) ; *Wall, Rec. Ind. Mus.* 1909, *p* 152.

Dipsadomorphus beddomei. *Wall, Spol. Zeylan.* 1921, *p* 406 ; *Oph. Tap.* 1921, *p* 282.

Length.—1,232 mm. (4 feet and ½ an inch).

Lepid.—Costals. In 19 rows to behind midbody, 15 or 13 two heads-lengths before the vent. Ventrals. 248 to 266. Subcaudals. 111 to 129.

Distn.—Western Ghats. Matheran to Travancore. *Ganjam Dist.* (Berhampore close to Hills.) *Ceylon.* C. Prov. (Kandy. Peradeniya.) N. Prov. (Mullaitivu).

Note.—I have examined 13 specimens.

230. (449) **Dipsadomorphus hexagonotus** (Stoliczka) (non Blyth) *The Tawny Cat Snake.*

Dipsas hexagonotus. *Anderson, P. Z. S.* 1871, *p* 185 (*part*) ; *Boulenger, Faun. Ind. Rept.* 1890, *p* 361 (*part*); *Stoliczka, J. A. S., Beng.,* 1870, *p* 198 (*part*); *Wall and Evans, Bomb. N. H. J. Vol XIII, pp* 346 *and* 615.

Dipsadomorphus hexagonotus. *Boulenger, Cat. Vol III,* 1896, *p* 65 (*part*); *Venning, Bomb. N. H. J. Vol XX, p* 342 ; *Wall, Rec. Ind. Mus.* 1909, *p* 154.

Length.—1,016 mm. (3 feet, 4 inches).

Lepid.—Costals. In 19 rows to behind midbody, 15 two heads-lengths before vent. Ventrals. 221 to 246. Subcaudals. 89 to 107.

Distn.—Burma. From Bhamo in the North to Tenasserim (Kawkareit) in the South. Chin Hills. (Haka.) S. Shan States. (Taunggyi.) *Andamans.*

Note.—This is not the snake described by Blyth as *hexagonotus.* (J. A. S., Beng., 1856, p 360.) His type specimen (No 8048 in the Indian Museum) is a young *D. cyaneus* (Dumeril and Bibron). It is probable that the specimens reported from Siam, Cochin-China and the Andamans are *hexagonotus*, but precise details regarding the lepidosis are wanting. I have examined 22 examples.

231. (444) **Dipsadomorphus trigonatus** (Schneider.) *The Common Cat Snake or Gamma Snake.*

Dipsas gokool. *Phipson, Bomb. N. H. J. Vol II, p* 247; *Traill, Bomb. N. H. J. Vol IX, p* 499.

Dipsas trigonatus. *Boulenger, Faun. Brit. Ind. Rept.* 1890, *p* 360; *Ferguson, Bomb. N. H. J. Vol X, p* 73; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 45; *Wall, Bomb. N. H. J. Vol XVI, p* 307.

Dipsadomorphus trigonatus. *Annandale, J. A. S., Beng.,* 1904, *p* 209; *Boulenger, Cat Vol III,* 1896, *p* 63; *Mullan, Bomb. N. H. J. Vol XVIII, p* 919; *Nurse, Bomb. N. H. J. Vol XIII, p* 340; *Sarasin, Zool. Jahr. Jena.* 1910, *p* 144; *Wall, Bomb. N. H. J. Vol XV, p* 524; *l. c. Vol XVIII, pp* 120 *and* 543; *l. c. Vol XIX, pp* 267*a and* 352; *l. c. Vol XX, pp* 864 *and* 1038; *l. c. Vol XXVI, p* 569; *Oph. Tap.* 1921, *p* 269.

Length.—940 mm. (3 feet, 1 inch).

Lepid.—Costals. 21 to behind midbody, 15 two heads-lengths before vent. Ventrals. 206 to 256. Subcaudals. 75 to 96.

Distn.—Peninsular India. To the Himalayas. *Punjab. Sind. Baluchistan. Transcaspia. N. W. Frontier. Western Himalayas.* Subathu. (Ind. Mus.) Almora. (F. W.) *Eastern Himalayas.* Sikkim. (F. W.) *Bengal.* As far East as Calcutta. *Ceylon.* Uva Prov. (Haldamulle. F. W.)

Note.—The snakes referred to by Anderson (J. A. S., Beng., Vol XL, p 35) from Assam and Naga Hills are probably *D. gokool*, a species with which *D. trigonatus* was frequently confused by early herpetologists.

232. (447) **Dipsadomorphus gokool** (Gray.) *Gray's Cat Snake.*

Dipsas gokool. *Boulenger, Faun. Brit. Ind. Rept.* 1890, *p* 360; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 46.

Dipsadomorphus gokool. *Annandale, Rec. Ind. Mus.* 1912, *pp* 37 *and* 49; *Boulenger, Cat. Vol III,* 1896, *p* 64; *Wall, Bomb. N. H. J. Vol XIX, p* 831.

Length.—870 mm. (2 feet, 10¼ inches).

Lepid.—Costals. 21 to behind midbody, 17 or 15 two heads-lengths before the vent. Ventrals. 224 to 232. Subcaudals. 87 to 101.

Distn.—Bengal. Jessore. Jalpaiguri. (Ind. Mus.) Darjeeling Dist. (F. W.). *Assam.* Sadiya. Sonapur. Sibsagar. (Ind. Mus.) Dibrugarh. Dejoo. (F. W.) Cachar (Monacherra. Bombay colln.) Garo Hills. (Tura. Bombay colln.) Khasi Hills. (Shillong. F. W.) Naga Hills. (Samaguting. Ind. Mus.). *Burma.* Manipur (F. W.).

Note.—Malay Peninsula I discredit for reasons cited in the note to *Typhlops bothriorhynchus.*

233. (*Nil.*) **Dipsadomorphus multifasciatus** Blyth. *The Himalayan Cat Snake.*

Dipsas multifasciatus. *Sclater, List. Sn. Ind. Mus.* 1891, *p* 46.

Dipsadomorphus multifasciatus. *Boulenger, Cat. Vol III,* 1896, *p* 69; *Wall, Rec. Ind. Mus.* 1907, *p* 157; *Bomb. N. H. J. Vol XIX, p* 352; *l.c. Vol XXVI, p* 866.

Length.—1,157 mm. (3 feet, 9½ inches).

Lepid.—Costals. In 21 rows to behind midbody, 15 two heads-lengths before the vent. Ventrals. 223 to 251. Subcaudals. 96 to 116.

Distn.—Himalayas. W. Himalayas. Subathu. Mussooree. Naini Tal. (Ind. Mus.) Naini Tal. Muktesar. (F. W.) *E. Himalayas.* Nepal. (Chitlong. Ind. Mus.) Darjeeling Dist. (Ind. Mus.) Pashok. Tindharia. Mungpoo. (F. W.)

Note.—I have seen over 20 specimens, and though uncommon, it appears to be about as numerous in the Western Himalayas as in the Eastern part of that Range, up to 7,000 feet.

234. (449) **Dipsadomorphus stoliczkæ** Wall. *Stoliczka's Cat Snake.*

Dipsas hexagonotus. *Boulenger, Faun. Brit. Ind. Rept.* 1890, *p* 65 (*part*); *Sclater, List. Sn. Ind. Mus.* 1891, *p* 47 (*part, No* 7932).

Dipsadomorphus hexagonotus. *Annandale, Rec. Ind. Mus.* 1909, *p* 281; *Boulenger, Cat. Vol III,* 1896, *p* 65 (*part*); *Rec. Ind. Mus.* 1913, *p* 338; *Wall, Bomb. N. H. J. Vol XIX, pp* 352 *and* 758; *Rec. Ind. Mus.* 1909, *p* 154.

Dipsadomorphus stoliczkæ. *Wall, Rec. Ind. Mus.* 1909, *p* 155.

Length.—1,105 mm. (3 feet, 7½ inches).

Lepid.—Costals. In 21 rows to behind midbody, 15 two heads-lengths before the vent. Ventrals. 223 to 252. Subcaudals. 100 to 119.

Distn.—Eastern Himalayas. Buxa Dooars to Sikkim. *Assam.* Goalpara. Sibsagar. Cachar. (Ind. Mus.)

Note.—Has been confused with *D. hexagonotus* Stoliczka, so I give only localities I can guarantee. I have examined in all 74 examples. It is to be noted that two specimens in the British Museum from Burma conform to this type, but their donor Colonel Beddome has been shown unreliable in many of his records. See note to *Natrix parallelus.*

Annandale (Rec. Ind. Mus. 1909, p 281) contests my view that this deserves specific rank apart from *hexagonotus.* To those who share his view this "form" should be considered a "variety" of *hexagonotus.*

235. (446) **Dipsadomorphus nuchalis** (Günther.) *The Collared Cat Snake.*

Dipsas ceylonensis. *Boulenger, Faun. Brit. Ind. Rept.* 1890, *p* 66 (*part*); *Sclater, List. Sn. Ind. Mus.* 1890, *p* 46 (*part except No* 7932).

Dipsadomorphus ceylonensis. *Boulenger, Cat. Vol III,* 1896, *p* 66 (*part*).

Dipsadomorphus nuchalis. *Wall, Rec. Ind. Mus. Vol XIX, p* 153; *l. c. Vol. XXI, p* 279; *Bomb. N. H. J. Vol XXVI, p* 571.

Length.—1,309 mm. (4 feet, 3½ inches).

Lepid.—Costals. In 21 rows to behind midbody, 15 two heads-lengths before vent. Ventrals. 234 to 251. Subcaudals. 90 to 108.

Distn.—Western Ghats. South of the Goa gap. Wynad to Travancore. Shevaroys. *Eastern Himalayas.* Nepal (Chitlong). *Assam.* Sibsagar. N. Cachar. (Ind. Mus.)

Note.—I have seen 60 examples. I have two skulls, the teeth of which number. Maxillary, 14 praecranterian, 2 cranterian. Palatine, 6 to 7. Pterygoid, 15 to 17. Mandibular, 20 to 23.

236. (*Nil.*) **Dipsadomorphus dightoni** (Boulenger.) *Dighton's Cat Snake.*

Dipsas dightoni. *Boulenger, Bomb. N. H. J. Vol VIII, p* 528; *Ferguson, Bomb. N. H. J. Vol X, p* 73.

Dipsadomorphus dightoni. *Annandale, J. A. S., Beng.*, 1904, *p* 210; *Boulenger, Cat. Vol III*, 1896, *p* 69; *Sarasin, Zool. Jahr. Jena.* 1910 *p* 136.

Lepid.—Costals. In 23 rows to behind midbody, 17 or 15 two heads-lengths before the vent. Ventrals. 228 to 241. Subcaudals. 95 to 102.

Distn.—*Western Ghats.* Travancore. [Pirmed. Brit. Mus. Ind. Mus. (No 13787).]

Note.—I have examined three specimens, the only ones known, all from Pirmed.

BOIGA *Fitzinger.*

1803 Hurria. *Daudin, part, Bull. Soc. Philom. Paris. III, No* 72, *p* 187 [*type Hurria rynchops* (*Schneider*)].

1826 Boiga. *Fitzinger, part, Neue. Class Rept. p* 29 [*type Coluber irregularis =Boiga irregularis* (*Merrem*)].

1827 Dipsas. (*non Laurenti*, 1768.) *Boie, part, Isis.*, *p* 548.

1843 ? Macrocephalus. *Fitzinger, Syst. Rept. p.* 27 [*type Dipsas drapiezii=Boiga ? drapiezi* (*Boie*)].

1843 Gonyodipsas. *Fitzinger, Syst. Rept. p* 27 [*type Dipsas irregularis=Boiga irregularis* (*Merrem*)].

1843 Eudipsas. *Fitzinger, Syst. Rept. p* 27 [*type Dipsas cynodon=Boiga cynodon* (*Boie*)].

1843 ? Cephalophis. *Fitzinger, Syst. Rept. p* 27 [*type Dipsas dendrophila=Boiga dendrophila* (*Boie*)].

1853 Opetiodon. *Dumeril, Prodr. Class. Ophid.* p 98 [*type O. cynodon=Boiga cynodon* (*Boie*)].

1853 Triglyphodon. *Dumeril, Prodr. Class. Ophid.*, *p* 111 [*type T. irregulare=Boiga irregularis* (*Merrem*)].

1857 ? Toxicodryas. *Hallowell, Proc. Philad. Acad. p* 60 (*type T. blandingi*).

1877 Pappophis. *Macleay, Proc. Linn. Soc. N. S. Wales, II, p* 39 [*type P laticeps=Boiga irregularis* (*Merrem*)].

1895 ? Liophallus. *Cope, Proc. Philad. Acad. p* 427 [*type Dipsas fusca=Boiga? fusca* (*Gray*)].

237. (446) **Boiga andamanensis** (Wall.) *The Andaman Cat Snake.*

Dipsas ceylonensis. *Stoliczka, J. A. S., Beng.*, 1870, *p* 198 (*part*).

Dipsas fusca. *Sclater, List. Sn. Ind. Mus.* 1891, *p* 47 (*part, Nos* 7928, 7929, 7930 and 8641).

Dipsadomorphus ceylonensis. *Annandale, J. A. S., Beng.*, 1905, *p* 174 (*part*) : *Stoliczka, J. A. S., Beng.*, 1856, *p* 360 (*part*).

Dipsadomorphus andamanensis. *Wall, Rec. Ind. Mus.* 1909, *p* 153.

Types.—In the Indian Museum from the Andamans.

Length.—1,486 mm. (4 feet, 10½ inches).

Lepid.—Costals, 21 to behind midbody, 15 two heads-lengths before the vent. Ventrals. 259 to 269. Subcaudals. 118 to 133.

Distn.—*Andaman Islands.*

Note.—I have seen 9 examples. I have one skull, the teeth of which number. Maxillary. 13 praecranterian, 3 cranterian. Palatine 7 to 8, Pterygoid 20. Mandibular 21 to 22.

238. (450) **Boiga cyanea** (Dumeril and Bibron.) *The Green Cat Snake.*

Dipsas hexagonotus. *Blyth, J. A. S., Beng.*, 1856, *p* 360 ; *Stoliczka, J. A. S., Beng., Vol XXXIX, p* 198 (*part*).

Dipsas fusca. *Sclater, List. Sn. Ind. Mus.* 1891, *p* 47 (*part, No* 8048).

Dipsas cyaneus. *Boulenger, Faun. Brit. Ind. Rept.* 1890, *p* 361 ; *Evans, Bomb. N. H. J. Vol XIII, p* 553 ; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 47 ; *Wall and Evans. Bomb. N. H. J. Vol XIII, pp* 188 *and* 346.

Dipsadomorphus ceylonensis. *Annandale, J. A. S., Beng.*, 1905, *p* 174 (*part*); *Sarasin, Zool. Jahr. Jena.* 1910, *p* 134 (*part*).

Dipsadomorphus cyaneus. *Boulenger, Cat. Vol III*, 1896, *p* 72; *Evans, Bomb. N. H. J. Vol XVI, p* 170; *Wall, Bomb. N. H. J. Vol XVIII, p* 329; *l. c. Vol XIX, p* 353; *Rec. Ind. Mus.* 1909, *p* 154.

Length.—1,448 mm. (4 feet, 9 inches).

Lepid.—Costals. 21 to behind midbody, 15 two heads-lengths before the vent. In some specimens the vertebral row divides as in other species of this genus. making the scale rows appear 23 in places. Ventrals. 237 to 257. Subcaudals. 124 to 134.

Distn.—*Eastern Himalayas.* Darjeeling. (Brit. Mus.) Tindharia. (F. W.) *Assam.* Cachar. (Ind. Mus.) Sonapur. Monacherra. (Bombay colln.). Khasi Hills. (Cherrapunji. Ind. Mus. Nongpho F. W.) *Burma.* Kokine, near Rangoon. (Evans) Insein near Rangoon. (Wall and Evans) Tavoy. (Ind. Mus.) *Siam.* Klong Menao. East of Sriracha. Koh Phai Island (Malcolm-Smith) *Indo-China.* (Mocquard.)

239. (*Nil.*) **Boiga cynodon** (Boie.) *Boie's Cat Snake.*

Dipsas cyanea. *Wall and Evans, Bomb. N. H. J. Vol XIII, p* 615.

Dipsas cynodon. *Sclater, List. Sn. Ind. Mus.* 1891, *p* 47.

Dipsadomorphus cynodon. *Boulenger, Cat. Vol III*, 1896, *pp* 78 *and* 164; *Wall, Bomb. N. H. J. Vol XIX, p* 353; *l. c. Vol XIX, pp* 832 *and* 899.

Lepid.—Costals. In 23 or 25 rows to behind midbody, 15 two heads-lengths before the vent. Ventrals (for Indian specimens). 249 to 277. Subcaudals (for Indian specimens). 114 to 147.

Distn.—*Eastern Himalayas.* Jalpaiguri. Tindharia. (F. W.) *Assam.* (Dibrugarh. F. W.) Cachar. (Ind. Mus). Garo Hills. (Ind. Mus.) Naga Hills. (Samaguting. Ind. Mus.) *Burma.* Thayetmyo. (Ind. Mus.) Toungoo. (Brit. Mus.) Rangoon. Myitkyina. (F. W.) Mergui. (Ind. Mus.) Burma-Siam Hills. (Ind. Mus.) *Siam.* Bangnara, Patani State. (M. Smith). *Malay Peninsula.* (Brit. and Ind. Mus.) *Malay Archipelago.* Borneo. (Brit. Mus.) *Philippines.* (Brit. Mus.)

240. (451) **Boiga forsteni** (Dumeril and Bibron.) *Forsten's Cat Snake.*

Dipsas forsteni. *Abercromby, Sn. of Ceylon.* 1910, *pp* 47 *and* 78; *Spol. Zeylan.* 1911, *p* 206; *l. c.* 1913, *p* 145; *Alcock and Rogers, Proc. Roy. Soc.* 1902, *p* 449; *Boulenger, Faun. Brit. Ind. Rept.* 1890, *p* 362; *Ferguson, Bomb. N. H. J. Vol X, p* 73; *Pearless, Spol. Zeylan.* 1909, *p* 54; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 47; *Willey, Spol. Zeylan.* 1903, *p* 82; *l.c.* 1906, *p* 233.

Dipsadomorphus forsteni. *Boulenger, Cat. Vol III*, 1896, *p* 80; *Sarasin, Zool. Jahr. Jena.* 1910, *p* 130; *Wall, Bomb. N. H. J. Vol XIX, p* 757; *l. c. Vol XXVI, p* 571; *Spol. Zeylan.* 1921, *p* 406.

Boiga forsteni. *Wall, Oph. Tap.* 1921, *p* 285.

Length.—2,313 mm. (7 feet, 7 inches).

Lepid.—Costals. In from 25 to 31 rows to behind midbody, 17 or 15 before the vent. Ventrals. 254 to 273. Subcaudals. 102 to 119 (131 Boulenger).

Distn.—*Ceylon. Peninsular India. Western Ghats.* Matheran to Travancore. *Ganges Valley.* Orcha. Fyzabad. Gorakhpur. (Bombay colln.) Balrampur. (F. W.) Purnea. Manbhum (Ind. Mus.). *Orissa.* Berhampore. (F. W.) *Bengal.* Sijna (F. W.). *Western Himalayas.* Naini Tal Dist. (Kaladungi. F. W.) *Eastern Himalayas.* Darjeeling Dist. (F. W.).

Genus.—TAPHROMETAPON *Brandt.*

241. (*Nil.*) **Taphrometapon lineolatum** Brandt. *Brandt's Sand Snake.*

Psammophis leithi. *Sclater, List. Sn. Ind. Mus.* 1891, *p* 50 (*part, No* 11697).
Psammophis schokari. *Wall, Bomb. N. H. J. Vol XX, p* 1039 (*part*).
Psammophis triticeus. *Wall, Bomb. N. H. J. Vol. XXI, p* 634.
Taphrometapon lineolatum. *Alcock and Finn, J. A. S., Beng.,* 1896. *p* 563 ; *Annandale, J. A. S., Beng.,* 1904, *p* 210 ; *Boulenger, Cat. Vol III,* 1896, *p* 151 ; *Sclater, List. Sn. Ind. Mus.* 1891 *p* 49.
Length.— 870 mm. (2 feet, 10¼ inches).
Lepid.—Costals. In 17 rows to behind midbody, 13 two heads-lengths before the vent. Ventrals. 174 to 197. Anal. Divided. Subcaudals. 72 to 107.
Distn.—Baluchistan. Quetta. Marachak. Chaman. Baleli. *Afghanistan. Persia. Turkestan. Aralo-Caspian Steppes.*

Genus.—PSAMMOPHIS *Boie.*

242. (454) **Psammophis leithi** Günther. *Leith's Sand Snake.*

P. leithi. *Boulenger, Cat. Vol III,* 1896, *p* 155 ; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 50 (*part, Nos* 7596, 8663, 8705 *and* 11453) ; *Wall. Bomb. N. H. J. Vol XVIII, pp* 120 *and* 203 ; *l. c. Vol XX, p* 1039,
Lepid.—Ventrals. 161 to 185. Subcaudals. 85 to 107.
Distn.—Ganges Valley. Fyzabad. Rae Bareli. (F. W.) Gwalior. (Brit. Mus.) Banda. N. W. P. (Ind. Mus.) *Cutch.* (Ind. Mus.) *Rajputana.* Ajmer. (Brit. Mus.) *Punjab.* Campbellpore. (Bombay colln.) *Sind.* Karachi. (Ind. Mus.) *Baluchistan.* Munro Khalat. (Brit. Mus.) Duki. (Quetta Mus.) *N. W. Frontier.* Thal. (F. W.)
Note.—A specimen in the Bombay collection (No 652) is labelled "Cannanore. Donor Major F. Wall." This is a mistake as I never obtained it from that locality. It is necessary to remark upon this to show that the records of this collection are not completely reliable, in spite of every care. (See note to *Silybura phipsoni.*)

243. (*Nil.*) **Psammophis schokari** (Forskal.) *Schokar's Sand Snake.*

P. leithi. *Sclater, List. Sn. Ind. Mus.* 1891, *p* 50 (part, *Nos* 4612. 4613, 4614, 7602, 7603, 8440, 8584, 8585, 8593, 10974, 11421, 13421, 13422.)
P. schokari. *Boulenger, Cat. Vol III,* 1896, *p* 157 ; *P. Z. S.* 1919. *pp* 290 *and* 305 ; *Wall, Bomb. N. H. J. Vol XVIII, p* 803 ; *l. c, Vol XX, p* 1039.
Lepid.—Ventrals. 174 to 186. (Boulenger, 162 to 195.) Subcaudals. 112 to 137. (Boulenger, 93 to 149).
Distn.—Punjab. Lahore. (F. W.) *Sind.* Karachi. Sukkur. *Baluchistan, Afghanistan. Persia. Syria. Arabia. Somaliland. N. Africa.* Sahara.

244. (456) **Psammophis longifrons** Boulenger. *Boulenger's Sand Snake.*

P. longifrons. *Boulenger, Cat. Vol III,* 1896, *p* 165 ; *D'Abreu, Bomb. N. H. J. Vol XXII, p* 634 ; *Dreckman, Bomb. N. H. J. Vol VII. p* 406; *Gleadow, Bomb. N. H. J. Vol VIII, p* 553.
Lepid.—Ventrals. 166 to 175.
Distn.—Peninsular India. Cuddapah Hills ? Bombay Dist. (Godra. Thana. Kalyan. Bulsar. Bombay colln.). Central Provinces (Nagpur).
Note.—I attach a query to Cuddapah Hills as this locality rests upon the sole authority of Beddome. (See note to *Natrix parallelus.*)

245. (455) **Psammophis condanarus** (Merrem.) *Merrem's Sand Snake.*

P. condanarus. *Boulenger, Cat. Vol III,* 1896, *p* 165 ; *Sclater, List, Sn. Ind. Mus.* 1891, *p* 50 (*part, all except No* 8730) ; *Wall and Evans, Bomb. N. H. J. Vol XIII, p* 617 ; *Wall, Bomb. N. H. J. Vol XVIII, p* 121 ; *l. c. Vol XX, p* 626.

Length.—978 mm. (3 feet, 2½ inches).

Lepid.—Ventrals. 156 to 188. Subcaudals. 71 to 92.

Distn.—*Cutch.* (Ind. Mus.) *Punjab.* Chillianwala. (Brit. Mus.) *Sind.* Kotri. (Brit. Mus.) *Western Himalayas.* Simla. (Ind. Mus.) Mussoorie. Almora. Muktesar. (F. W.) *Ganges Valley.* Fyzabad. (F. W.) Lower Bengal. (Ind. Mus.) *Burma.* Pegu. (Brit. Mus.) Prome. Bassein. (Ind. Mus.) Tharrawady. (F. W.) S. Shan States. (Brit. Mus.) *Siam.* (Brit. Mus.)

Genus.—PSAMMODYNASTES *Günther.*

246. (453) **Psammodynastes pulverulentus** (Günther.) *The Mock Viper.*

P. pulverulentus. *Annandale, Rec. Ind. Mus.* 1912, *pp* 37, 50 *and* 54 ; *Boulenger, Cat. Vol III,* 1896, *p* 172 ; *Rec. Ind. Mus.* 1913, *p* 338 ; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 49; *Venning, Bomb. N. H. J. Vol XX, p* 342 ; *l. c. Vol XX, pp* 72 *and* 774 ; *Wall and Evans, Bomb. N. H. J. Vol XIII, pp* 349 *and* 617 ; *Wall, Bomb. N. H. J. Vol XVIII, pp* 204 *and* 330 ; *l. c. Vol XIX, pp* 353, 758 *and* 833 ; *l. c. Vol XX, pp* 73 *and* 686.

Length.—629 mm. (2 feet and ¾ of an inch).

Lepid.—Subcaudals. 44 to 71.

Distn.—*Eastern Himalayas.* Buxa Dooars to Sikkim. *Assam.* Hills and Plains North and South of the Bramaputra. *Burma.* From Katha (Long. 96·1°. Lat. 24·1°) in the North to Tenasserim. *Malay Peninsular. Siam. Indo-China. S. China. Malay Archipelago.* Sumatra to Celebes. *Philippines. Formosa.*

Genus.—DRYOPHIS *Dalman.*

247. (457) **Dryophis perroteti** (Dumeril and Bibron.) *Perrotet's Whip Snake.*

D. perroteti. *Boulenger, Cat. Vol III,* 1896, *p* 178 ; *Sarasin, Zool, Jahr. Jena.* 1910, *p* 138 ; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 513. *Wall, Bomb. N. H. J. Vol XVII, p* 7 ; *l. c. Vol XXVI, p* 572.

Length.—585 mm. (1 foot, 11 inches).

Lepid.—Subcaudals. 65 to 84.

Distn.—*Western Ghats.* N. Canara. Nilgiris.

248. (459) **Dryophis fronticinctus** Günther. *Günther's Whip Snake.*

D. fronticinctus. *Boulenger, Cat. Vol III,* 1896, *p* 179; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 51 ; *Wall and Evans, Bomb. N. H. J. Vol XIII, p* 346 ; *Wall, Bomb. N. H. J. Vol XVII, p* 7 ; *l. c. Vol XIX, p* 353.

Length.—864 mm. (2 feet, 10 inches).

Lepid.—Ventrals. 168 to 196.

Distn.—*Eastern Himalayas.* Darjeeling Dist. (F. W.) *Assam.* Sibsagar. (Ind. Mus.) *Burma.* Watiya. Rangoon. (F. W.) Pegu. (Brit. Mus.)

Note.—I think the specimens from Darjeeling and Assam will prove to constitute a species distinct from *fronticinctus.* In two Burmese specimens in the Indian Museum (Nos 7791 and 7792) I find the praecranterian teeth (behind the second edentulous space) 6, and 7 (? 8) respectively. In the specimen from Dibrugarh (preserved in the Bombay collection) these teeth number 3, and in a specimen from Sibsagar in the Indian Museum (No 6924) they number 4. I cannot however discover any difference in lepidosis. It is significant that the Burmese species which Stoliczka (J.A.S., Bengal, Vol XXXIX, p 197) reports a true brackish water species common about the mouth of the Moulmein River, and Theobald (Cat. Rept. Brit. Burma, p 53) reports "by no means scarce" in the Mangrove swamps on the Arakan Coast, should not have been recorded anywhere in Burma except at the mouths of rivers, and should again be found far inland in Assam, and in the Darjeeling District.

249. (458) **Dryophis dispar** (Günther.) *Beddome's Whip Snake.*

D. dispar. *Boulenger, Cat. Vol III,* 1896, *p* 179 ; *Ferguson, Bomb. N. H. J. Vol X,* 1895, *p* 73 ; *Fischer, Bomb. N. H. J. Vol XXIV p* 194 ; *Sarasin, Zool. Jahr. Jena.* 1910, *p* 142 ; *Sclater, List. Sn. Ind. Mus.* 1891, *p.* 51 ; *Wall, Bomb. N. H. J. Vol XVII, p* 7.

Length.—788 mm. (2 feet, 7 inches).

Lepid.—Ventrals. 136 to 156. Subcaudals. 78 to 106.

Distn.—*Western Ghats.* Nilgiris to Travancore.

Note.—The snake alluded to by Mocquard (Rept. L'Indo-Chine, 1907, p 47) is obviously not this species, or if the identification is correct did not come from Indo-China.

250. (460) **Dryophis prasinus** Boie. *Boie's Whip Snake.*

Annandale, Rec. Ind. Mus. 1912, *pp* 37, 50 *and* 54; *Boulenger, Cat. Vol III,* 1896, *p* 180 ; *Rec. Ind. Mus.* 1913, *p* 338 ; *Evans, Bomb. N. H. J. Vol XVI, p* 169; *Wall and Evans, Bomb. N. H. J. Vol XIII, p* 616; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 51; *Wall, Bomb. N. H. J. Vol XVII, p* 7 ; *l. c. Vol XIX, pp* 353, 825, 834 *and* 899.

Lepid.—Ventrals. 194 to 235. (196 to 215 for Indo-Burmese specimens). Subcaudals. 151 to 207. (155 to 182 for Indo-Burmese specimens.).

Distn.—*Bengal.* Jalpaiguri Dist. (F. W.) *Eastern Himalayas.* Sikkim. Bhutan. *Assam.* Plains and Hills North and South of the Bramaputra River. Chittagong Hills. *Burma.* As far North as Mansi. (Lat. 24·7°. Long. 95·7°.) South to Tenasserim. East to S. Shan States. *Malay Peninsula. Siam. Indo-China. Malay Archipelago.* Sumatra to Celebes. *Philippines.*

251. (461) **Dryophis mycterizans** (Linné.) *The Common Green Whip Snake.*

D. pulverulentus. *Sclater, List. Sn. Ind. Mus.* 1891, *p* 52 (*part, Nos* 7811 *and* 7816).

D. mycterizans. *Abercromby, Sn. of Ceylon,* 1910, *pp* 49 *and* 63 ; *Spol. Zeylan.* 1911, *pp* 205 *and* 207 ; *l. c.* 1913, *p* 144 ; *Alcock and Rogers, Proc. Roy. Soc.* 1902, *p* 450 ; *Annandale, Mem. A. S., Beng., Vol* 10, *p* 196; *Boulenger, Cat. Vol III,* 1896, *p* 182; *Caius, Bomb. N. H. J. Vol XXVII, p* 862; *Evans, Bomb. N. H. J. Vol XVI, p* 169 ; *Ferguson, Bomb. N. H. J. Vol VI, p* 420; *l. c. Vol X, p* 73 ; *Green, Spol. Zeylan.* 1903, *p* 36; *Kinlock, Bomb. N. H. J. Vol XXVI, p.* 681; *Kinnear, Bomb. N. H. J. Vol XXI, p* 1336; *Pearless, Spol. Zeylan,* 1909, *p* 54 ; *Primrose, Bomb. N. H. J. Vol XV, p* 347 ; *Sarasin, Zool. Jahr. Jena.* 1910, *p* 131; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 52; *Wall and Evans, Bomb. N. H. J. Vol XIII, pp* 347 *and* 615 ; *Wall, Bomb. N. H. J. Vol XVI, pp* 308, 394 *and* 542 ; *l. c. Vol XVII, p* 7 ; *l. c. Vol XVIII, pp* 783 *and* 919 ; *l. c. Vol XIX, p* 757 ; *l. c. Vol XX, pp* 229 *and* 524 ; *l. c. Vol XXVI, p* 572 ; *Spol. Zeylan.* 1921, *p* 401 ; *Oph. Tap.* 1921, *p* 291; *Willey, Spol. Zeylan.* 1906, *p* 227.

Length.—1,944 mm. (6 feet, 4½ inches).

Lepid.—Ventrals. 168 to 206. (Peninsular India, 168 to 188. Bengal, E. Himalayas and Burma, 176 to 206.) Subcaudals. 136 to 174. (Peninsular India, 137 to 174. Bengal, E. Himalayas, and Burma. 140 to 153.)

Distn.—Ceylon. Peninsular India. Excluding the Ganges Valley West of Patna. *Bengal. Eastern Himalayas. Assam. Burma. Siam. Indo-China.*

Note.—I question the reliability of Mount Abu (Ind. Mus.) and Allahabad on the authority of the von Schlagintweits. These collectors are also responsible for the records of *Eryx conicus* and *Eryx johni* from Sikkim at 4,900 and 9,800 feet respectively. This is an extremely common species in the stock in trade of itinerant jugglers, and all the three species alluded to may have been derived from this source. *Vide* my note to *Hurria rynchops.*

252. (462) **Dryophis pulverulentus** (Dumeril and Bibron.) *The Brown Speckled Whip Snake.*

D. pulverulentus. *Abercromby, Sn. of Ceylon,* 1910 *pp* 49 *and* 79 ; *Spol. Zeylan.* 1913, *p* 144 ; *Boulenger, Cat. Vol III,* 1896, *p* 184 ; *Ferguson, Bomb. N. H. J. Vol. XIV, p* 386 ; *Sarasin, Zool. Jahr. Jena.* 1910, *p* 128 ; *Sclater, List. Sn. Ind. Mus.* 1891 *p* 52 (*part. No* 8386) ; *Wall, Bomb. N. H. J. Vol. XXII, p* 639 ; *l. c. Vol XXVI, p* 574 ; *Spol. Zeylan.* 1921, *p* 401 ; *Oph. Tap.* 1921, *p,* 302 ; *Willey, Spol. Zeylan.* 1903, *p* 84.

Lepid.—Ventrals. 179 to 202. Subcaudals. 161 to 207.

Distn.—Ceylon, Western Ghats. Nilgiris to Travancore.

Genus.—CHRYSOPELEA *Boie.*

253. (463) **Chrysopelea ornata** (Shaw.) *The Gold and Black Tree Snake.*

C. ornata. *Abercromby, Sn. of Ceylon,* 1910, *pp* 49 *and* 80 ; *Annandale, J. A. S., Beng.,* 1904, *p* 210 ; *l. c.* 1905, *p* 176; *Boulenger, Cat. Vol III,* 1896, *p* 196; *Evans, Bomb. N. H. J. Vol XVI, p* 170; *Ferguson, Bomb. N. H. J. Vol X, p* 74; *Millard, Bomb. N. H. J. Vol XV, p* 348; *Sarasin, Zool. Jahr. Jena.* 1910, *p* 134; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 53 ; *Wall and Evans, Bomb. N. H. J. Vol XIII, pp.* 345 *and* 614; *Wall, Bomb. N. H. J. Vol XV, p* 525 ; *l. c. Vol XVII, p* 1035 ; *l, c. Vol XVIII, p* 227 ; *l. c. Vol XIX, pp* 757a *and* 899 ; *l. c. Vol XXVI, p* 574 ; *Spol. Zeylan.* 1921, *p* 401 ; *Oph. Tap.* 1921, *p* 305 ; *Willey, Spol. Zeylan.* 1906, *p* 230.

Length.—1,400 mm. (4 feet, 7⅛ inches).

Lepid.—Subcaudals. 100 to 144.

Distn.—Ceylon. Western Ghats of India. South of the Goa gap to Travancore. *Bengal.* As far West as Patna. *Eastern Himalayas.* Buxa Dooars to Sikkim. *Assam. Burma. Nicobars. Siam. Indo-China. S. China. Malay Peninsula. Malay Archipelago.* Sumatra to Celebes. *Philippines.*

Sub-family 6.—ELACHISTODONTINAE.

Genus.—ELACHISTODON *Reinhardt.*

254. (452) **Elachistodon westermanni** Reinhardt. *Westermann's Snake.*

Boulenger, Cat. Vol III, 1896, *p* 264 ; *Sarasin, Zool. Jahr. Jena.* 1910, *p* 146; *Sclater, List. Sn. Ind. Mus.* 1891, *p* 48; *Wall, Bomb. N. H. J. Vol XXII, p* 400.

Lepid.—Costals. Two heads-lengths behind the head 19, midbody 15, two heads-lengths before the vent 15. Ventrals. 208 to 217.

Distn.—Bengal. Rangpur. (Type, Copenhagen Museum.) Purnea (Ind. Mus.) Jalpaiguri. (Bombay colln.)

(*To be continued.*)

* THE MAMMALS AND BIRDS OF KASHMIR AND THE ADJACENT HILL PROVINCES.

BEING NATURAL HISTORY NOTES.

BY

COL. A. E. WARD.

(*With 7 plates and four photos.*)

The task before me is to write a series of articles on the fauna of Kashmir and the adjacent hills; the idea is to produce a book of reference in a popular form and at the same time not to lose sight of the scientific side.

When describing the larger animals, it may be possible to interest a large number of the readers of this magazine, but the naturalist alone will care to study the notes on the small mammals.

The difficulty ahead is the prevailing fashion of sub-dividing species, and giving generic rank which in many instances is not due.

Environment often conduces to change in size and colour. In many cases these characteristics pass from the parent stock to the offspring, this however cannot be said to be the universal rule, hence latent variations may be found in some of the descendants, in plain language a throw back may occur and these variations may be transmitted; hence great caution is required before the acceptance of a new type.

Take the "Voles" as an example, the variations seem to be endless, and many of the smaller Rodentia present great difficulties in their classification.

Without implying that the naturalist is not in need of further knowledge of large animals, it is undoubtedly the case that by far the largest scope for research is amongst the small mammals such as the rats, mice, bats, etc.

Hence it is proposed to note on the larger animals before passing on to the smaller, for this arrangement will give more time in which all the specimens can be arranged and examined.

CLASS—MAMMALIA.

ORDER—UNGULATA.

In this group are included the four-footed animals which have no claws at the ends of their toes, they are provided with sheaths or hoofs into which the digits fit; these vary in number, for instance the elephant has five in the front and four on the hind foot, and each toe has a sheath.

The horse has one hoof, the ruminants and pigs have cloven hoofs which contain the two central toes, whilst the exterior toes are less developed and do not reach the ground, but here again these two are provided with hoofs.

The cloven hoofs stand flat on the ground and are the only ones of any use to the animal except perhaps when it treads on soft snow or mud, even then very little support would be given to the body; it is reasonable to suppose that in some future stage of evolution these apparently useless toes may disappear.

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*The following Natural History Notes have been written by Col. Ward as a supplement to his articles on "Big and Small game shooting in Kashmir". [Eds.]

The feet of the camel do not follow the usual formation of the ruminating quadrupeds, the two toes are enclosed in a common sole and have a fatty covering.

The Ungulates are divided up into various suborders and families, the first to be dealt with is that of the horses.

SUBORDER I.—*PERISSODACTYLA.*

Family—EQUIDAE.

THE HORSE, ASS AND ZEBRA.

A single member of this family is found in the area now dealt with:—

THE ASIATIC WILD ASS—*Equus hemionus,* The "Kiang" of Tibetans.

Distribution.—Ladak, Turkistan, Mongolia, and in various countries in Asia.

The variety of wild ass known as the "Ghorka" which differs little from the "Kiang" is found in Cutch, Sind and Baluchistan.

Description.—The colouring of the upper portion of the body is a ruddy chestnut which varies in tinge, in some specimens being more or less red. Underneath white. A dark brown dorsal stripe extends from the nape of the neck to the tuft of the tail, the hair in this tuft is practically black, so also is that round the coronet and at the tip of the ears.

Height of a stallion shot in Ladak just over 11 hands. The skull 18½ ins.

Looking at the body of a "Kiang," attention is at once drawn to the large size of the head, and the small hard hoofs, which look as if contracted.

The "Kiang" is much given to galloping. On the hard stony plains, its great weight and the velocity with which it travels, but for the protection afforded by nature, would destroy the whole structure of the leg.

The foot bone known as the coffin bone of the horse or ass does not fill the hoof, moreover it is provided with passages which permit the flow of the blood to a padding of fleshy material which is elastic, and thus the jar caused is so much reduced as to be innocuous. The leg of a horse presents a most interesting study, it is very complicated and delicate, but the above note indicates why a "Kiang." can gallop over the rocky ground with impunity.

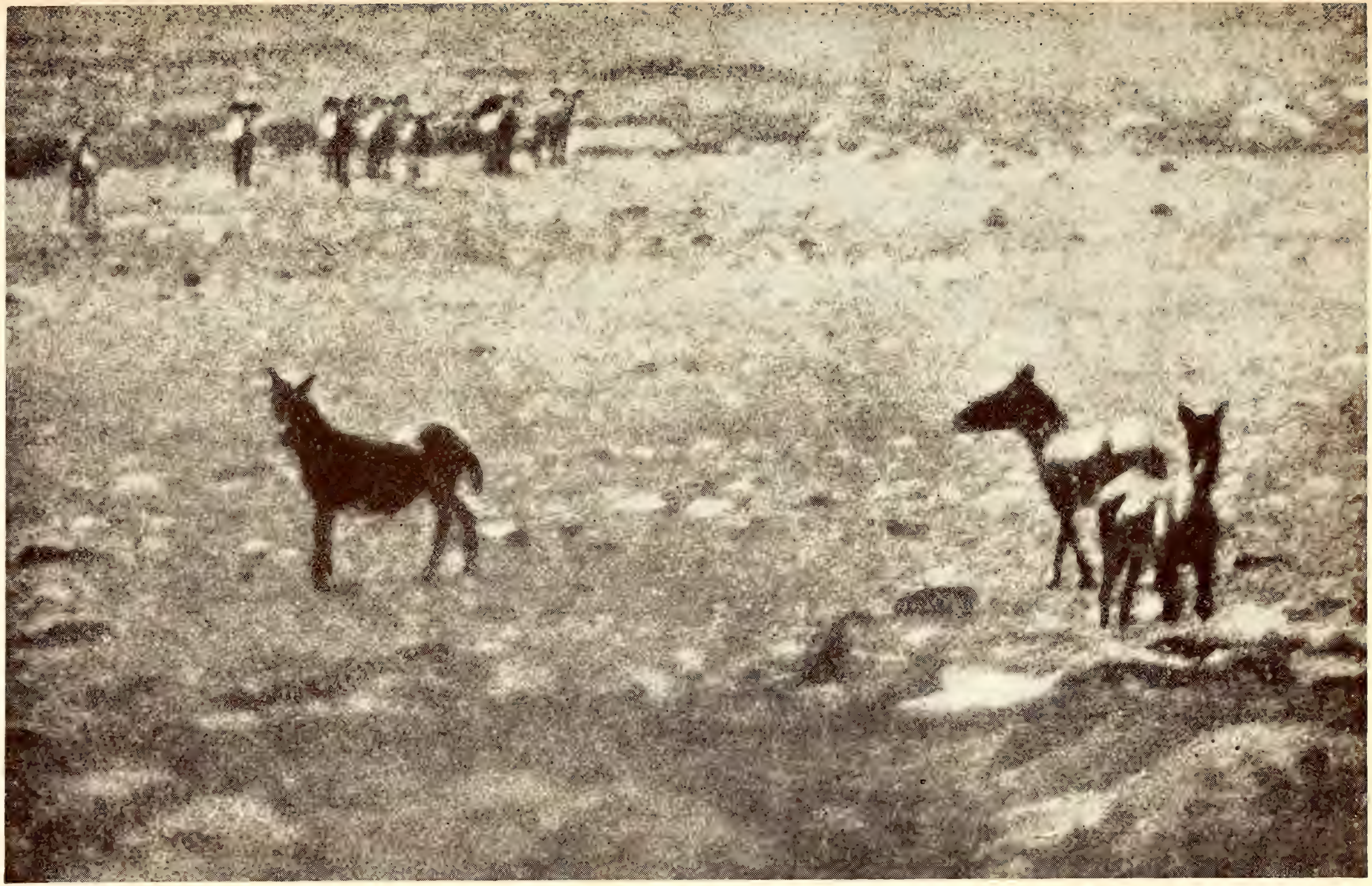
General Notes.

The wild ass is shy but inquisitive; when suspicious the herd will approach at a considerable pace, then, when the danger is confirmed, they will sometime stand for a second or two, snort and gallop off. A herd may consist of almost any number, but as a rule three to ten or twelve asses are to be seen together.

Many a stalk after wild sheep and antelope is spoilt by the "Kiang." . . . The photographs, for which I am indebted to Col. C. B. Wood, show three asses standing between the wild sheep and the stalker, and the ending of the chance of a shot, for the "Kiang" have got suspicious and given the alarm.

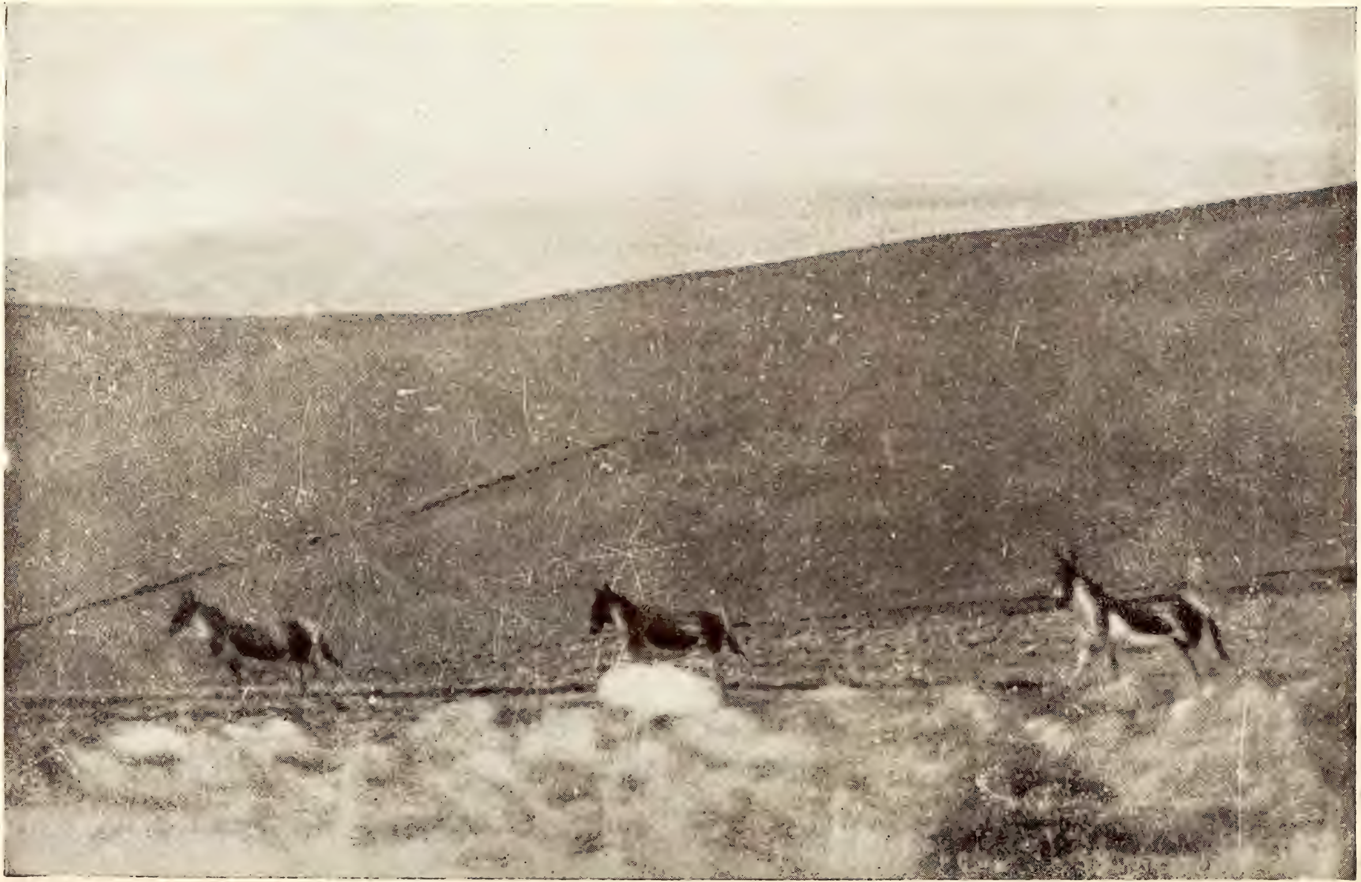
To the sportsman the "Kiang" is only a disadvantage; the skin is useful for the soles of numdah boots and for patching the coverings of mule trunks. The Tartars will eat the flesh, and so also do the wolves.

Rarely a young "Kiang" is caught and partially tamed, one or two were with the Wazir of Ladak's ponies and wandered about near Leh, but they were very shy.



(*Photo by Col. C. B. Wood.*)

KIANG STANDING BETWEEN THE STALKER AND HERD OF GREAT TIBETAN SHEEP (*OVIS AMMON HODGSONI*).



(*Photo by Col. C. B. Wood.*)

KIANG GOING OFF, HAVING FULLY SPOILT THE STALK.

SUBORDER II.—*ARTIODACTYLA.*

Section A.—PECORA.

Family—BOVIDAE.

Subfamily i.—*Bovinæ,*

Included in this family are cattle, sheep, goats, antelopes and gazelles, all of which have horns consisting of a core covered with a sheath. These are permanent. In many of the species both sexes carry horns. The genus *Bos* has only one representative in the area dealt with.

THE YAK—*Bos grunniens.*

The "Dong" of Tibetans—also the "Bon-Chour"—is found in Northern Ladak and on most of the uplands of Tibet.

Description.—Male. Height 16 hands, a big bull 16½ ; length 7 ft. ; horns 30″ to 33″ any measurement above this being rare, 35¼″ is undoubtedly a correct measurement of a pair, and 39″ has been recorded. The females are smaller and have short horns.

An old bull when standing within about 50 yards looked as if it were a mass of black hair with scarcely any length of leg. These masses of hair hung down nearly to the ground from the shoulders and sides, also from the chest. The tail which does not reach the ground had a very large bunch of black hair over a foot in thickness. After shooting the bull the following notes were made:—

" Colouring blackish but with a brown hue—muzzle grey, hoofs very large, fore legs almost entirely concealed by hair, both at the sides and front, probable weight 900 to 1,000 lbs. Height just over 16 hands."

The photo of a bull yak is unfortunately much fore-shortened, but the horns are clear and show the outward and inward curves, they are 31″ long and 17″ in girth.

The sense of smell is highly developed, as also appears is that of hearing, it is said that sight is deficient but this seems to be doubtful.

General Notes.

Yak are gregarious, seldom found in large herds except in the spring and summer when large numbers of cows and calves congregate on a good grazing ground. Bulls are generally found in parties of three or four until the late summer, when the rutting season commences and extends through July, August and September, then one male is accompanied by four or five or more cows.

The calves are well grown at a year old.

Wild yak cross freely with the Ladaki cattle which are turned out when the pairing season begins. Dr. Heber informs me "The hybrids do not breed at all but the crossing of the yak and cow is quite easy."

The local name of the hybrid is phonetically "Zo" for the male, and " Tsomo " for the female animal. The cross-bred beasts are very sure footed, they are used for riding, and are capable of carrying a load of 200 lbs. on very difficult ground. When the camping ground is reached the yaks are turned out to fend for themselves, up to a certain point they are enduring but when once tired, they lie down and refuse to move. The Ladakis declare that many of the wearied animals get up when hungry and wander off to where they can get grazing, and are retrieved in the following summer.

When starting on a long trip I was pressed to buy a small sized red baggage yak which would bring luck ; this animal was seldom loaded for fear the 'mascot' should tire, yet on the return journey, and when within two Marches of Tankse, the driver reported the creature had lain down, and would not go on and would have to be sent for later. At any rate the purchase of that red 'Zo' was a cheap form of amusement, for the price paid was Rs. 10 only.

There may be some superstition which exalts the red creature into the position of a 'Mascot', but I suspect the Ladaki coveted it and thought of this method of acquiring it.

Subfamily ii.—*Caprinæ.*

SHEEP—*Ovis.*

This genus is represented by *O. hodgsoni, O. ammon* and *O. poli* and allied forms, but these are the three large sheep of Ladak and Central Asia, and in addition there is *O. vignei*, this last has a wide range in both hot and cold climates and also has closely allied races.

THE GREAT TIBETAN SHEEP—*Ovis ammon hodgsoni.*

This is the Nyan of Ladakis, and is known to sportsmen as the Ammon, whereas the true *Ovis ammon* is the species found in Siberia and Mongolia.

Description.—The ram weighs about 240 lbs. and measures 46″ at the shoulder, from between the horns to the tail 5′-4″, tail 3″.

A very large ram was 47″ at the shoulder. Length 5′-5″ and scaled 280 lbs.; it owned very thick horns with the points broken off.

There is some doubt as to the size of the largest horns. Rowland Ward's "Records of Big Game" mentions a pair of horns from Tibet as 57″. If this was from a Hodgson's ram it is far the longest. Three trophies of 50″ to slightly over 51″ in length have been carefully measured, one of these had a girth of 19″. Horns of 45″ with a girth of 17″ are good and exceptional.

Judging from many heads of ewes which were picked up, the ewes carry horns of 18″, but one pair, found near Haule, was 20″ long; they are straight for the greater part of their length and gently twisted at the top. The female is of considerable size and must weigh 150 lbs. or more.

The male is light brown above, and white on the chest, stomach and on the insides of the legs. The ruff is whitish, a dark brown line of long hair extends along the back. Early in the summer the upper portions are greyish brown. When viewed through glasses the white chest and neck are very obvious. Females are brownish on the upper part, the colour merging into a brownish or yellowish-white in the lower parts. I never had a chance of measuring a ewe. The females of the Central Asian sheep are all large.

General Notes.

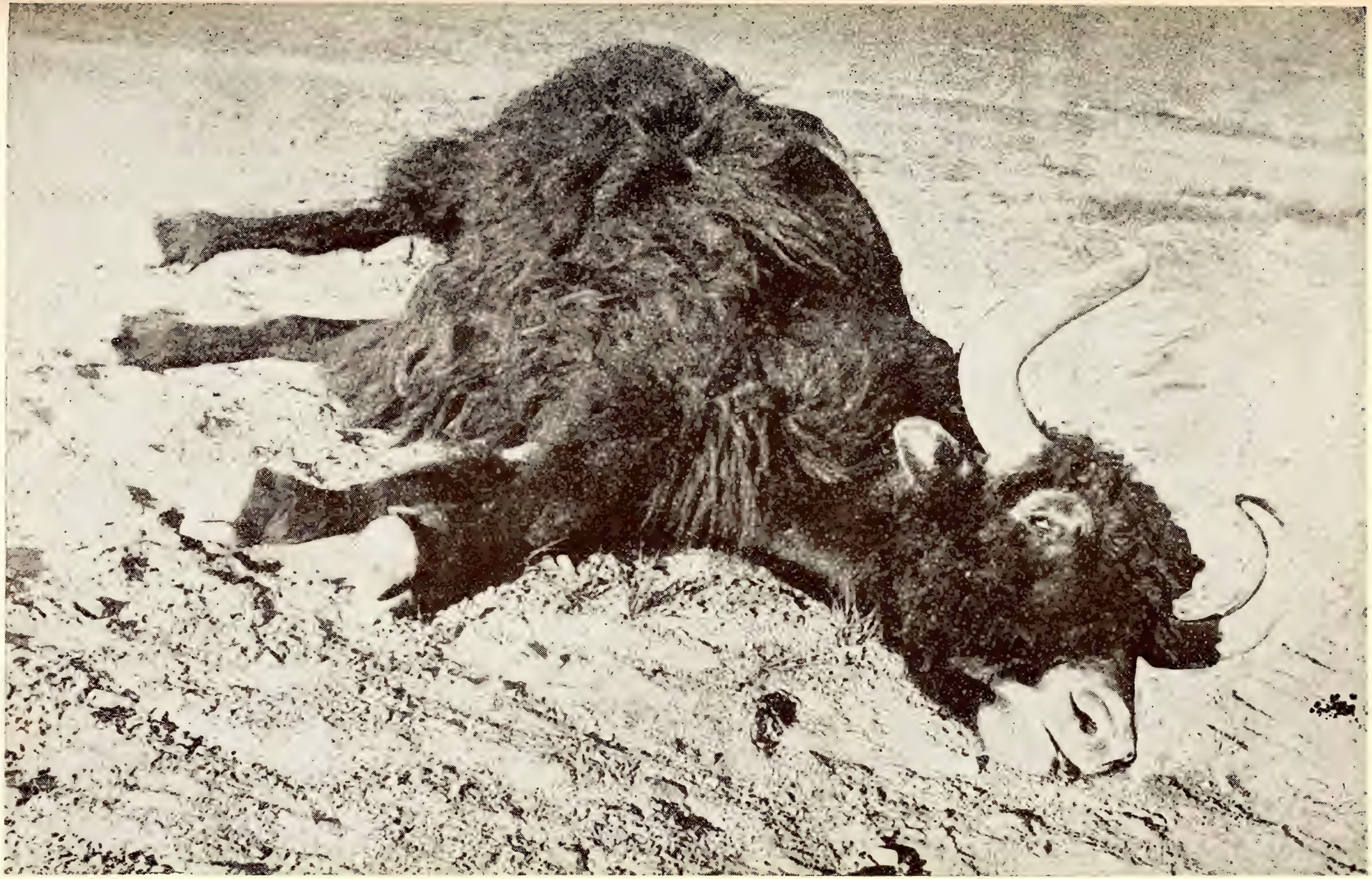
There is no beard. Like the rest of the sheep, the glands under the eyes and in the division of the cleft hoof are present.

Gregarious and migratory, the Hodgson's sheep wander in small flocks from place to place searching for their food, hence in one year numbers may be found in a tract of country whilst in the next season not a single animal can be seen.

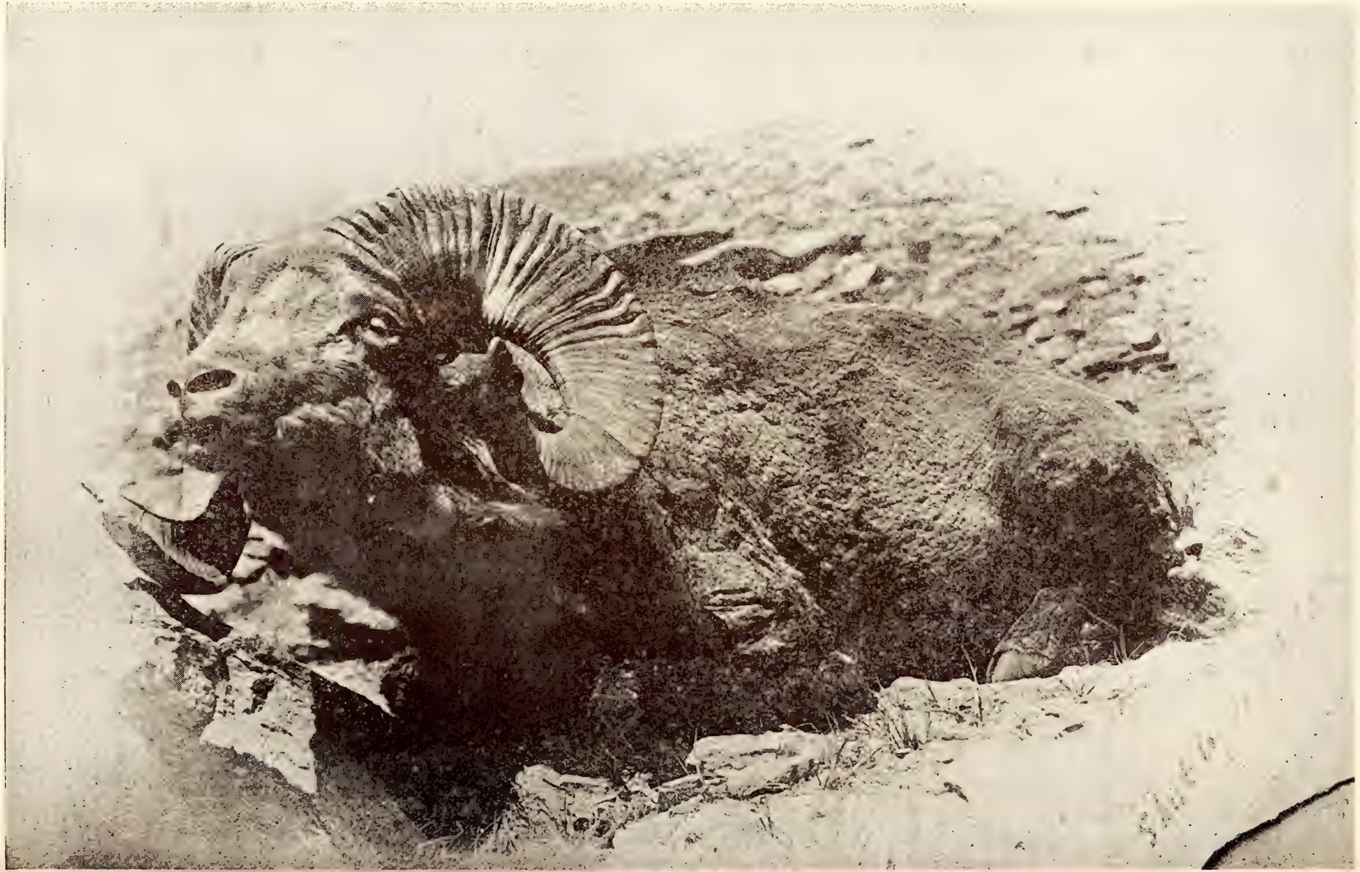
The flocks in the very early summer may consist of both sexes and may number from about three or four to ten or more, then as the season advances four or five rams may be alone; the females and young congregate in mid summer.

As recorded in the "Sportsman's Guide" I have seen three lambs with a single ewe, and on two or more occasions, twins.

Shy by nature, also possessing keen powers of scent and sight, these sheep are hard to approach. When they have taken up their summer quarters, having found grazing, the rams may be sighted day after day,



BULL YAK FROM TIBET (*BOS GRUNIENS*).



GREAT TIBETAN SHEEP (*OVIS AMMON HODGSONI*) FROM GOGRA—CHANGCHENMO.

it is therefore desirable to be patient and to wait until the game is favourably placed for a stalk before making the attempt, for once thoroughly frightened they will trek for many miles and ascend the highest mountains. At the best of times it is useless to expect to find them under 14,000′ to 16,000′ in the summer.

The open ground, which is the general rule in Ladak, tells both ways for and against the sportsman, it may make the stalk difficult, but it enables the game to be located.

Plate IV shows a Hodgson's sheep left out at night to freeze and photographed in the morning by Capt. J. Y. Allan.

Plate V shows heads of three animals, including a hybrid between a ram of Hodgson's sheep and a Ewe Urial (Vigne's sheep). This hybrid was at one time called *O. brookei*, and was first noticed in the Rampak ravine, Ladak. Three or four of these cross-bred sheep have since been obtained, whether they would produce offspring or not cannot be discovered, but that the two species occasionally cross is not open to doubt.

The pairing season is in the early winter and the Hodgson's ram probably was driven down to the lower ground by the weather and could easily force the Vigne's ram away.

The cross-bred between Vigne's ram and the Hodgson's ewes is more difficult to explain—possibly the ram was killed and ewes were joined after this by the male Oorial. I have only heard of one such hybrid which was shot by Major Cumberland many years ago. The Oorial must have wintered much higher up the hill than is their usual habit, for the Hodgson's sheep rarely come below 13,000′. The Ladakis say that the presence of the ewes of the Nyan must have been due to their being driven by wolves.

SIBERIAN ARGALI—*Ovis ammon ammon.*

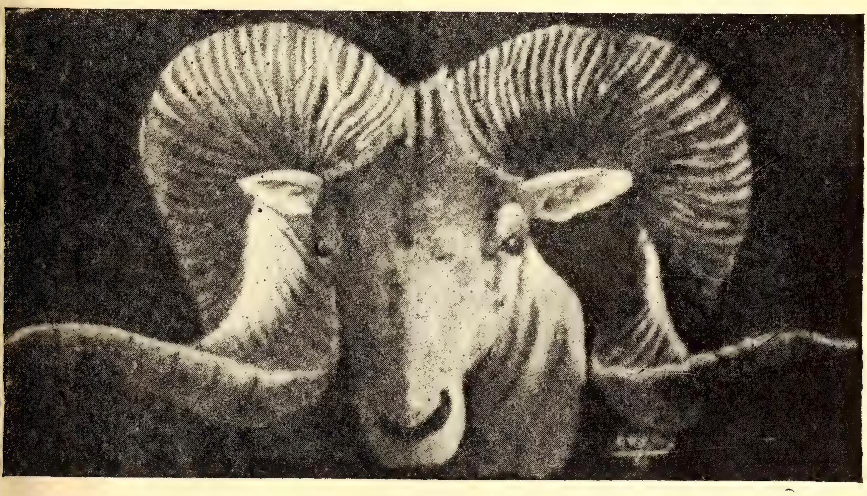


Fig. I.—Typical Siberian or Altai Argali. *Ovis ammon ammon* from the Altai. Shot by Major C. S. Cumberland

The typical race of Ammon is found in Mongolia and differs from Hodgson's sheep in the shape of the horns and in the absence of the white ruff. It has been stated that the Ammon is the largest of the Central Asian sheep. I have however no record of any that exceeds that of the huge Hodgson's ram which weighed 280 lbs.

There is a considerable difference between an animal shot in April that has gone through 5 or 6 months of semi-starvation, and one obtained in August or September which has been grazing freely for 3 or 4 months. Probably any full grown ram of the larger sheep exceeds 200 lbs. and does not reach 300 lbs. in weight.

The Siberian or Altai Ammon (*O. ammon ammon*) is devoid of the white ruff on the neck, and comes chiefly from the Altai, the southern parts of Siberia, and northern Mongolia. The Mongolian Ammon (*O. ammon mongolica*) is not entirely devoid of the ruff, but the hair is not pure white nor so much developed as in Hodgson's sheep. It is found to the eastward in Mongolia. The type locality being the Gobi Desert of Mongolia.

The Altai animal has very large horns of 60″ in length and upwards. Rowland Ward gives the record at 62¼″ by 19¼″ in girth.

The second form which for convenience sake has been styled the "Mongolian Ammon" has smaller horns, and in addition differs slightly in colouring. Fig. I shows the Altai Ammon's head, it was shot by Major Cumberland and measures

Length on Curve.	Girth.	Tip to Tip.
56½″	18½″	38½″

This is a typical head, the horns turn abruptly outwards but not downwards at the points. In some specimens there is a slight tendency to do so, but not to a marked degree. See the head of the Siberian Argali, B. N. H. Society Journal Vol. XXVIII, page 336. Below is given a fine specimen shot by Colonel C. B. Wood.

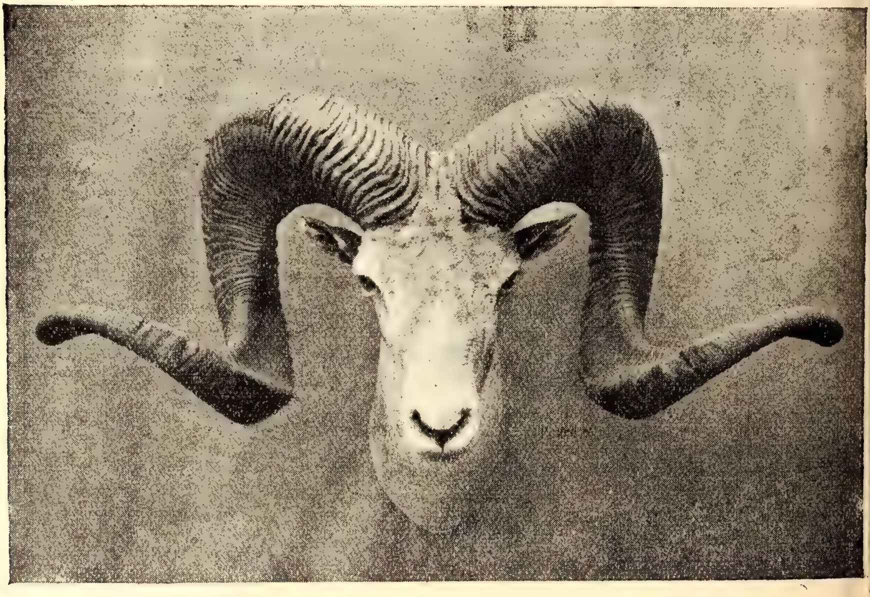
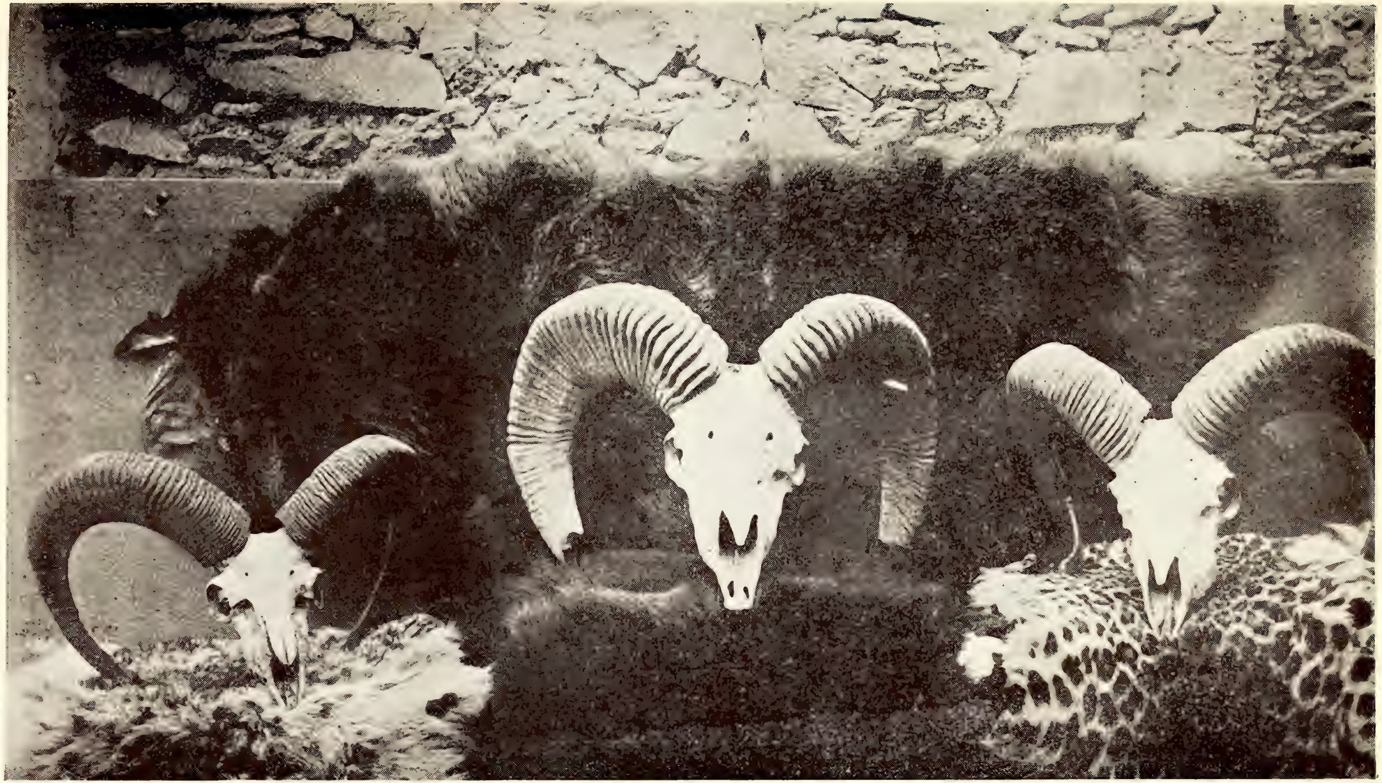


Fig. II.—Siberian Argali (*Ovis ammon ammon*).
From the Altai shot by Col. C. B. Wood.
62¼″ by girth 19½″ Tip to tip 41½″.

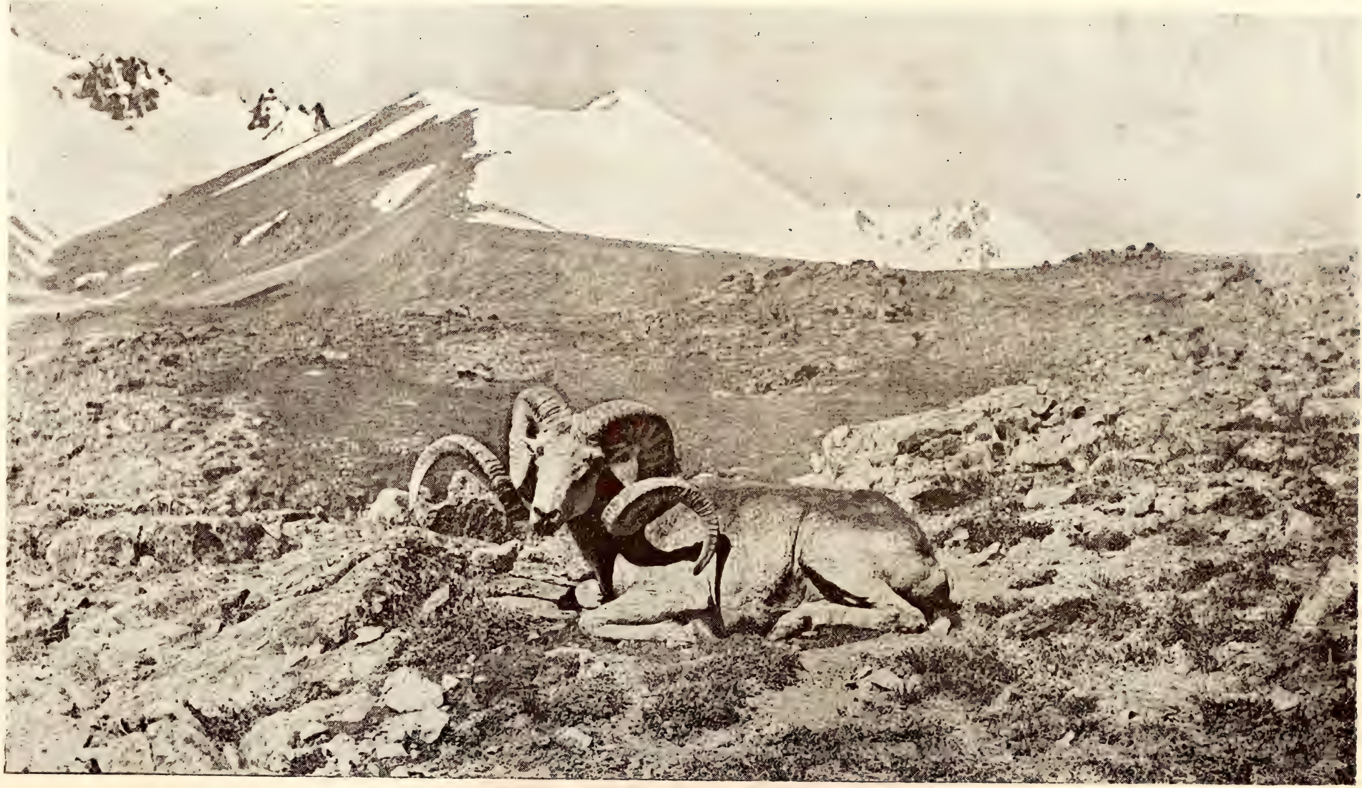


OORIAL.
(*Ovis vignei vignei.*)

GREAT TIBETAN SHEEP.
(*Ovis ammon hodgsoni*)

HYBRID.
(*O. ammon.* + *O. vignei.*)
The hybrid is from Rampak, Ladak.

Plate VI.



OVIS AMMON POLI.

Shot by Col. G. Sullivan, 63,″ girth $14\frac{3}{8}$″.

There are three closely allied forms:—one to the westward and south-west of the Altai on the Irtish river and adjacent mountains; this is a smaller race, the horns are more twisted at the extremity and turn downwards, but the habitat of these and other closely allied forms is beyond the geographical scope of this article, in fact the real object of dwelling on the various forms of the Ammon which are outside Ladak and the Pamirs is to point out to sportsmen who visit Kashmir territory that the Great Tibetan Sheep or *O. ammon hodgsoni* is not the true *ammon.*

THE GREAT PAMIR SHEEP—*Ovis ammon poli.*

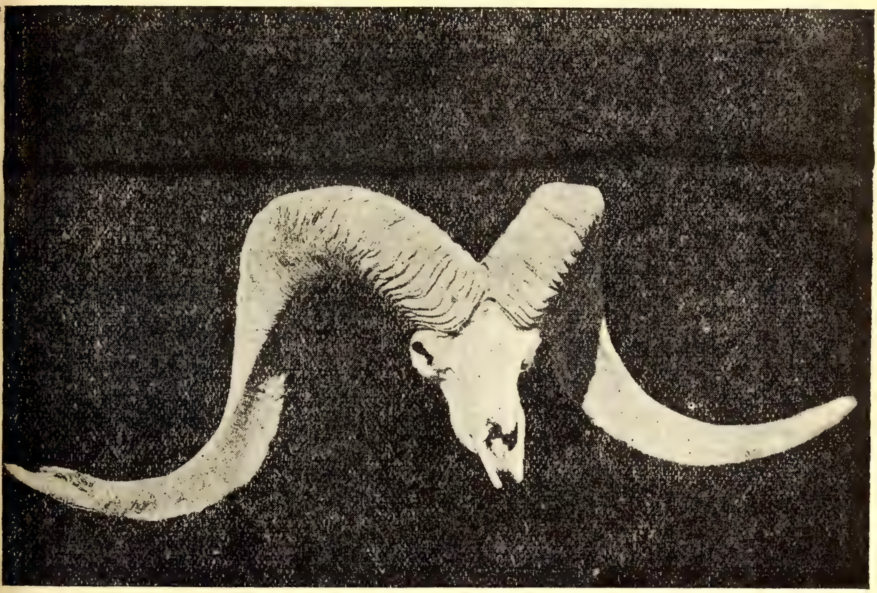


Fig. III.—Great Pamir Sheep. *Ovis ammon poli.* A picked up head brought to Kashmir—1874.

The Kulja.—This sheep is in many respects like the closely allied race from Ladak (*O. ammon hadgsoni*). The ram is smaller and measures 43″ to 44″ at the shoulder and weighs about 220 lbs. The white ruff and dark crest are present in both species, but the Poli has a white muzzle. In this respect it resembles the sheep found in the Irtish and Sair district, which have been briefly alluded to already.

The few skins I have seen of this sheep are darker on the upper body than those of the Hodgson's sheep, the tail is longer, but the chief difference is in the horns which unlike those of the Ammon turn considerably downward at the tips.

The ewe is of large size and has horns which are very similar to those of the Great Tibetan Sheep, and are about 17″ long.

The horns were brought down to Srinagar in large numbers between 1875 and 1888. Every collector wanted a specimen and every sportsman who could afford the expense and could get a permit wanted to shoot a ram.

There is not much difference in the general shape of the horns, although some have the downward bend much tucked in towards the sides of the skull, and in others the outward turn is a good deal splayed.

At first there was a good deal of speculation as to whether there were two species of Marco Polo's sheep, and one was tentatively called Karelini. This name is now apparently used for an inferior form of *poli* which come from Tian Shan.

As many of the horns were obtained through traders, the exact locality from which they came could not often be guaranteed. The two photos show the horns which were amongst the first to arrive in Kashmir, both, as is evident, were 'picked up heads'. No. 2 is 73″ along the curve and is 16″ in girth hence it nearly approaches the record of 75″ × 16¾″ which used to hang on the walls at Snowdon in Simla.

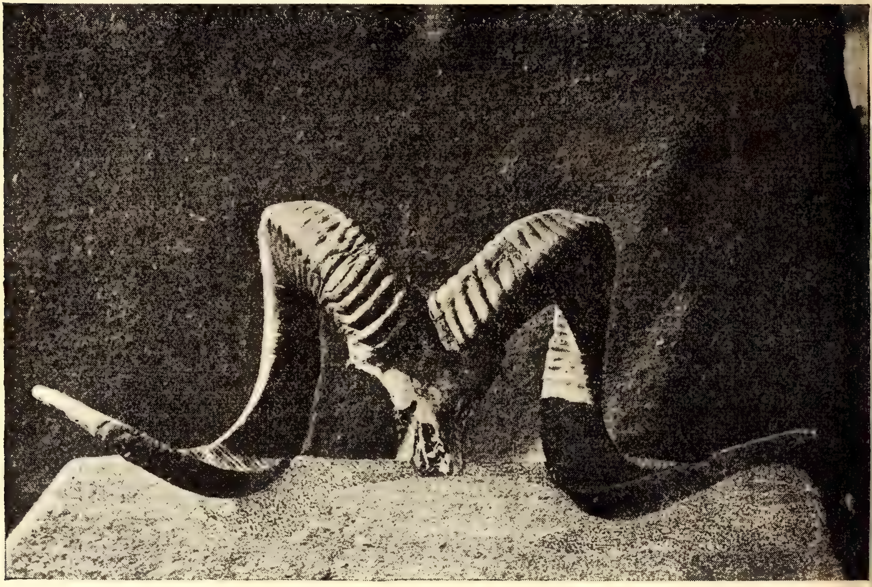
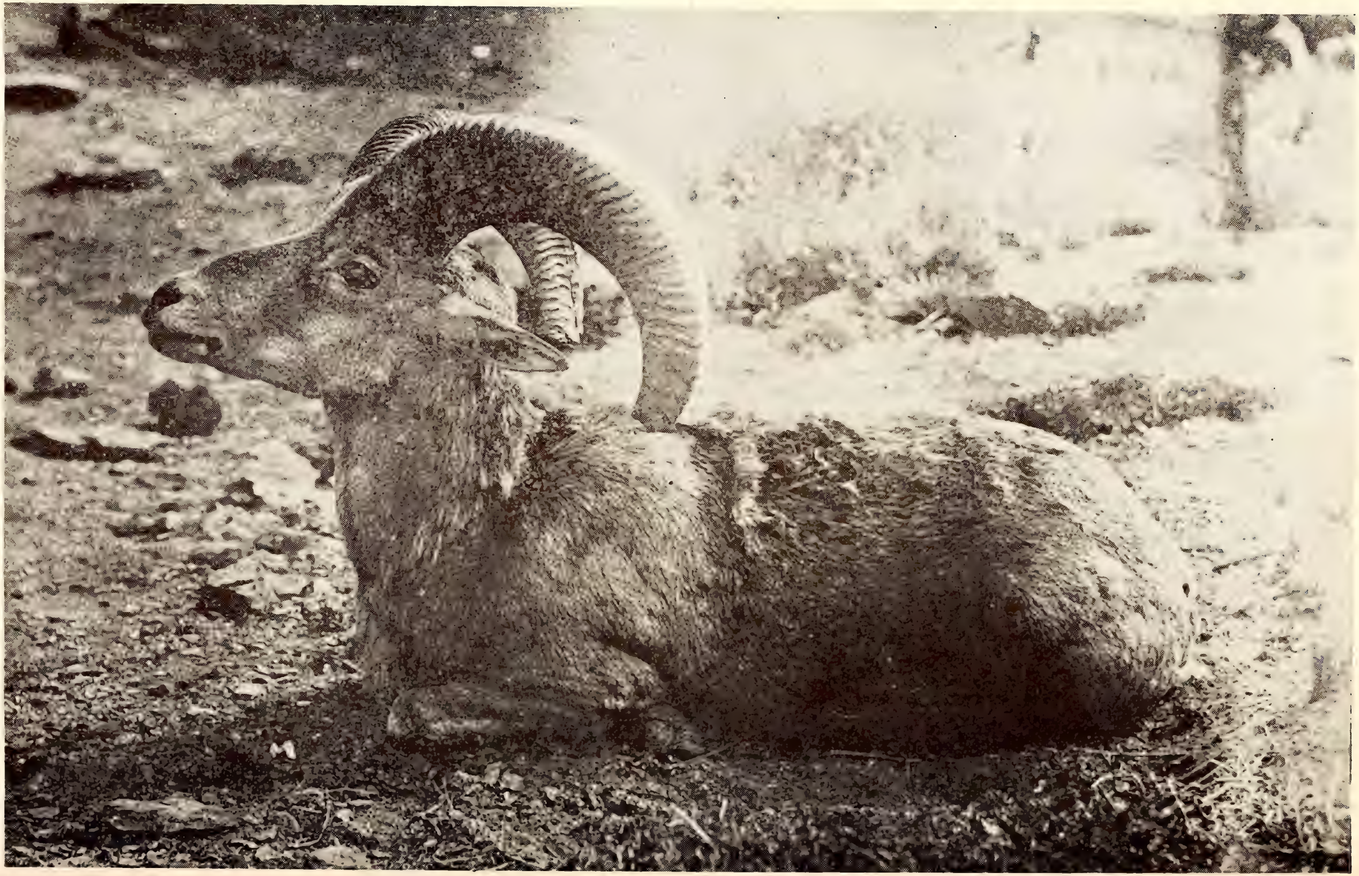


Fig. IV.—Great Pamir Sheep, *Ovis ammon poli.* 73″ × 15″. One of the first to be brought from "Little Pamirs."

The horns of the Great Pamir sheep do not girth as much as those of the Great Tibetan sheep, (*O. a. hodgsoni*) and out of dozens of heads I have seen none come quite up to 17″. A reference to the B.N.H.S. Journal, Vol. XXVIII, page 337, will show that, out of the 13 heads of *O. ammon hodgsoni* mentioned, 8 exceed 17″ in girth, which is by no means uncommon. Large horns are now seldom seen. The photo of a *poli* shot by the late Colonel G. Sulivan shows what is the best obtained of late years. The length is 63″, girth 14¾″. A good head just under 60″ was brought down in 1922, but from all accounts the increase in the number of rifles owned by the Khirgis and others has enabled them to shoot large numbers of *poli* and the many horns lying about point to the reason for the decrease mentioned.

Lately I was told that this sheep had suffered from rinderpest; this is quite possible for the disease has been prevalent in some of the far hills, but the improved rifle is probably the main cause of the trouble.

Plate VII.



THE OORIAL (*OVIS VIGNEI*) FROM LADAK.

SEP 7 1927

URIAL OR OORIAL.—*Ovis vignei.*

There is but little difference to be traced between the various sheep which are generally known as the Urial or Vigne's sheep.

The following are the forms of local races :—

1. The Sha or Sharpu of Ladak.	*Ovis vignei vignei.*
2. The Urial of the Punjab.	*Ovis vignei punjabensis.*
3. The Gad of Baluchistan.	*Ovis vignei cycloceros.*
4. The Ouch or Arkhar of Persia.	*Ovis vignei arkar.*

The Urial is smaller than the Sharpu, rarely exceeding 32″ at the shoulder whilst the latter stands 34″. The weight of the Sharpu is about 125 to 130 lbs., that of the Urial 10 to 15 lbs. less.

The ruff, which is almost black, is fully developed on the Punjab Urial, whilst the Sharpu, although it has a decided ruff in the winter, does not even carry the very dark ruff which in the Urial falls well down the chest.

The Urial horns are not so thick as those of the Sharpu or the Gad. The Ouch or Arkhar of Persia has horns exceeding in length and equalling in girth those of the Sharpu or the Gad.

The Gmelin sheep *O. orientalis gmelini* of Asia Minor is known as the Red Sheep and is allied to those mentioned, but ewes which in all the other races carry small horns do not do so.

After all that can be said in regard to the shape of the horns the variations in colouring and the presence or the partial absence of the ruff, there is practically nothing to justify the separation of these sheep into different species. They extend from the Salt Range of the Punjab to the North-Western Frontier, from Sind to Baluchistan and Afghanistan, and from Ladak to Turkistan and into Persia. With so extensive a habitat it would be strange if there were no variations in size and colour.

The record horns of the Punjab form are figured in Rowland Ward's last edition, they were got by my friend Col. H. V. Biggs, R.E., and taped 36″ by 9¾″ in girth, the points turn upwards rather sharply, more so than is generally the rule.

The finest Sharpu horns are 39″ × 11¾″.

The horns also mentioned as near 'Leh' are 36¼″ × 11¾″ and, if they had not been broken at the points would probably have been nearly the record, they are very circular in shape and resembles those of the Afghan Urial (*Ovis v. cycloceros*).

The winter garb of a ram is a greyish-brown or red on the back, the legs have dark hair on the outside, the rest being white as also is the chest and the lower part of the body. The ruff is black in some of the races and induced to rufous in others. As the Summer approaches the colouring is generally less defined and redder.

Ewes are as a rule greyish-brown and keep much the same colouring in both seasons, the under parts are of a paler tinge than the upper.

General Notes.

Active and shy if at all persecuted, Vigne's sheep is easily tamed and crosses freely with tame sheep. It frequents for choice fairly easy ground but when disturbed will take to the precipices.

Sharpu and Urial kept four miles from Srinagar used to be loose on the hills, and would join the tame flocks when out grazing, they would come back as far as the homestead but did not enter the enclosures, but would stay close at hand and go up hill in the morning. Dogs used to worry them and finally they disappeared and were probably killed by leopards.

(*To be continued.*)

SCIENTIFIC RESULTS FROM THE MAMMAL SURVEY

No. XLIV

ON A NEW FIELD-MOUSE FROM NEPAL, WITH A NOTE ON THE CLASSIFICATION OF THE GENUS *APODEMUS.*

BY OLDFIELD THOMAS, F.R.S.

(By permission of the Trustees of the British Museum.)

Among the mammals obtained in Nepal by Mr. N. A. Baptista, on behalf of the Bombay Natural History Society's Mammal Survey, are 16 specimens of a mouse quite unlike any we have hitherto received, and evidently a very distinct species.

With a certain superficial resemblance to *Mus pahari* or the Metad, it is really an *Apodemus*, and would seem to be the most western and one of the most southern members of the group with 2-2=8 mammæ, of which various species have been described from Burma and further east.

It may be called :—

Apodemus gurkha, sp. n.

Size medium. Fur rather soft, but not very long, hairs of back about 8—9 mm. in length; no spines intermixed. General colour dark smoky or bluish-grey, nearest to "deep mouse-grey" of Ridgeway, darker on the back, more drabby on the sides. Under-surface soiled greyish, the hairs slaty for two-thirds their length, washed with greyish white; line of demarcation not sharply defined. Ears medium, blackish, darker than the head. Hands and feet white. Tail rather longer than the head and body, with about 13 rings of scales to the centimeter, finely haired, not tufted, blackish above, dull whitish below, not very sharply defined. Mammæ 2-2=8.

Skull smooth, rounded, with well-filled braincase, somewhat as in *A. mystacinus*, although smaller. Less angular and ridged than in *speciosus*, though faint but distinct supraorbital ridges are present, which do not however pass backwards on to the braincase. Palatal foramina of medium length. Bullæ small.

Teeth with the characteristic structure of the *sylvaticus-speciosus* section of the genus, not as in *agrarius*; tri-lobular character of m3 well marked.

Dimensions of the type :—

Head and body 102 mm.; tail 118; hindfoot 24; ear 16.

Skull, greatest length 29; condylo-incisive length 26·3; zygomatic breadth 14·5; nasals 11; interorbital breadth 4·5; breadth of braincase 12·8; palatal foramina 6; upper molar series 4·2.

Hab.—Nepal. Type from Laprak, Gorkha; altitude about 11,500′.

Type.—Adult male. B. M. No. 23.11.5.44. Original number 941. Collected 9 May 1923 by N. A. Baptista, and presented by the Bombay Natural History Society. 16 specimens examined.

This species would appear to be most nearly allied to the *A. speciosus* group, of which a number of species and subspecies have been described. But it is readily distinguishable by its dark greyish colour and by the detailed characters of its skull and teeth. The related western forms all have 1-2=6 mammæ.

While studying this Nepalese mouse I have again examined the characters that separate the various groups of *Apodemus*, with especial regard to the question as to whether they are all strictly congeneric. The most salient point concerns the considerable differences that exist between *agrarius*, with its near allies *chevrieri* and *fergussoni*, and the *sylvaticus-mystacinus-speciosus* group. These differences, in external form, skull and dentition, have been set out by Forsyth Major*, by myself† and more fully and completely by Hinton,‡ the latter giving a good account, with figures, of the dental structure in the various forms.

The characters, however, are inclined to be nearly all inconstant, either individuals or races, and it would therefore seem to be inadvisable to separate the two groups as genera. But none the less I think the subject would be simplified if they were considered as subgenera, the name *Apodemus* to be used for the *agrarius-chevrieri* group and the new name *Nemomys* for the *sylvaticus-mystacinus-speciosus* group, Linnæus's *Mus sylvaticus* being taken as the genotype of the latter.

That these groups are natural is evidenced by the general external appearance of the animals, by the shape of the skull, compressed, ridged, and convex upwards in *Apodemus*, rounded, smooth, and with flat or concave forehead in *Nemomys*, as well as by the various dental characters described, of which the most constant are the trifid structure of the inner side of m3 in *Nemomys*, while bifid in *Apodemus*, and the common presence in the former of an antero-exterior cusplet on m2, this being absent in *Apodemus*.

The following is a list of the more important names which occur in *Apodemus*, arranged alphabetically under their respective subgenera; those of *Nemomys* again divided by the number of mammæ.§

Apodemus (s. s.)

agrarius (type), *chevrieri*, *coreæ*, *fergussoni*, *harti*, *mantchuricus*, *ningpoensis*, *rubens*.

Nemomys.

Mammæ 1-2=6.

arianus, *epimelas*, *flavicollis*, *fridariensis*, *hayi*, *hebridensis*, *hirtensis*, *ilex-mystacinus*, *pentax*, *rusiges*, *semotus*, *sylvaticus* (type), *tscherga*, *wardi*, *wintoni*.

Mammæ 2-2=8.

ainu, *draco*, *geisha*, *gurkha*, *latronum*, *nigritalus*, *orestes*, *peninsulæ*, *speciosus*.

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* Proc. Verb. Atti. Soc. Tosc. IV, p. 135, 1884.

† P. Z. S., 1912, p. 135.

‡ Hist. Brit Mamm. II, p. 504, 1914.

§ This divison is inserted as an aid to memory, but is clearly no certain indication of the true affinities of the species. Thus *A*. (*N*.) *semotus*, with six mammæ is obviously more related to the *speciosus* group, with eight, than it is to *sylvaticus* and its allies.

THE IDENTIFICATION OF INDIAN BUTTERFLIES.

By Lieut.-Colonel W. H. Evans, D.S.O., R.E., F.Z.S., F.E.S.

Part IV.

(*With* 5 *plates.*)

(*Continued from page* 707 *of this Volume.*)

F. Nymphalidæ.—The Nymphalids. Key to genera.

1a (51a). Hindwings channelled to receive abdomen.

1b (48a). F v12 not swollen.

1c (18a). Larva, where known, smooth and the head with horns. Palpi with no long projecting hairs.

1d (4a). F v8 from before the middle of v7. Eyes smooth. Palpi smooth and white. Antennæ longer than half costa, club gradual. F cell closed and upper apex right angled. Body stout.

1e (3). F costa serrate. H pre-costal as a spur forward. Larva with 4 horns on the head.

1 (2). H cell closed.

Charaxes, Ochs. The Rajahs. (Plate 17).

2 (1). H cell open.

Eribœa, Hub. The Nawabs. (Plate 17).

3 (1e). F costa smooth. H precostal curved back.

Prothoe, Hub. The Begums. (Plate 17).

4a (1d). F v8 never from before the middle of v7.

4b (14a). F upper end of cell opposite well before the origin v3.

4c (9a). Palpi white or brown throughout. Antennæ longer than half costa.

4 (5a). F upper end of cell obtuse; v10 ex 7; cell open. Eyes smooth. Antennæ club sharply spatulate.

Helcyra, Fd. The White Emperor. (Plate 17).

5a (4). F upper end of cell right angled or acute; v10 ex cell. Antennæ club stout, gradual.

5 (6a). Cells closed. Eyes hairy. F v9 from well beyond end cell. H pre-costal forked. Forelegs hairy.

Dilipa, M. The Golden Emperor. (Plate 18).

6a (5). Cells open.

7 (7a). F v3 much shorter than the mv. Genitalia of ♂ protruding. Eyes hairy.

Eulaceura, M. The Elegant Emperors. (Plate 18).

7a (6). F v3 nearly equal to the mv. ♂ genitalia not protruding.

7 (8). F origin v8 nearer termen than origin v9. Eyes smooth or hairy. Larva with 2 horns.

Apatura, F. The Emperors. (Plate 18).

8 (7). F origin v8 nearer origin v9 than termen. Eyes smooth.

Herona, Db. The Pasha. (Plate 18).

9a (4c). Palpi black or black and white. Antennæ equal to half the costa. Cells open. H pre-costal mostly straight.

9b (12a). F v10 ex 7. Larva with 2 horns.

9 (10a). Palpi very long, black with a white tip.

Sephisa, M. The Courtiers. (Plate 18).

10a (9). Palpi short, only white at base.

10 (11). Eyes smooth.

Euripus, Wd. The Courtesans. (Plate 18).

11 (10). Eyes hairy.

Diagora, Snell. The Sirens. (Plate 18).

12a (9b.) F v10 ex cell. Eyes smooth. Palpi mostly black.

12 (13). F end v 12 long before origin of v9.

Hestina, Wd. The Circe. (Plate 18).

F. Nymphalidae.—Key to genera.—(*contd.*).

13 (12). F v12 ends after the origin of v9.

Sasakia, M. The Empress. (Plate 18).

14a (4b). F upper end cell opposite origin of v3 or beyond. Cells closed. Antennæ and palpi black.

14b (16a). F upper end of cell right angled. H pre-costal straight or curved back.

14 (15). F lower dcv straight. Antennæ equal to one-third costa. Eyes hairy. H v8 ends before apex.

Calinaga, M. The Freaks. (Plate 21).

15 (14). F lower dcv highly curved. Antennæ equal to half the costa. Eyes smooth. H v8 ends at apex as usual.

Penthema, Wd. The Kaisers. (Pate 21).

16a (14b). F upper apex of cell acute. Eyes hairy.

16 (17). H pre-costal straight. Antennæ longer than half costa.

Dichorragia, But. The Constable. (Plate 19).

17 (16). H pre-costal curved forward. Antennæ shorter than half costa.

Stibochiona, But. The Popinjay. (Plate 19).

18a (1b). Larva not smooth.

18b (30a). Larva with tubercles, never with more than a few rows of spiny processes. Palpi and antennæ never black.

18c (20a). Larva on either side with a complete row of very long horizontal pinnate processes. Eyes and palpi smooth. F upper end cell opposite beyond the orgin of v3, right angled or acute. Pre-costal well curved forward and arises from well before the origin of v8. F origin v11 from far before the end of the cell, opposite origin v2. Antennæ longer than half costa, club gradual.

18 (19). F cell, if closed, lower dcv ends at origin v3.

Euthalia, Hub. The Barons, Counts, etc. (Plates 19-20).

19 (18). F cell closed and lower dcv ends well beyond origin v3.

Adolias, Hub. The Archdukes. (Plate 20).

20a (18c). Larva without long horizontal pinnate spines.

20b (27a). Larva without long horns on the head.

20c (22a). H precostal from beyond origin v8. Eyes smooth. Cells closed. F upper apex cell acute and far beyond opposite origin v3.

20 (21). Palpi with thin long hairs. H pre-costal forked at end. F v9 distorted and arises just before 8.

Parthenos, Hub. The Clipper. (Plate 21).

21 (20). Palpi smooth. H pre-costal curved forward. F vs 9, 10, 11 distorted, but 9 rises well before 8.

Lebadea, Fd. The Knight. (Plate 21).

22a (20c). H pre-costal rises from origin v8. Antennæ club slender.

22b (26a). H v8 reaches apex. Palpi smooth. H pre-costal curved forward.

22 (23a). F v1 highly sinuous, vs 9 and 10 distorted. Cells closed. Eyes smooth. Antennæ equal to half costa.

Neurosigma, But. The Panther. (Plate 21).

23a (22). F v1 straight.

23 (24a). F lower dcv highly concave. H cell open or shut; F shut. Eyes smooth. Antennæ equal to half costa.

Abrota, M. The Sergeant-major. (Plate 21).

24a (23). F lower dcv nearly straight. Antennæ equal to or longer than half costa. Eyes smooth or hairy. Cells open or shut.

24 (25). F upper end cell opposite origin v3 or beyond.

Liminitis, F. The Admirals, etc. (Plates 21-22).

25 (24). F upper end cell before opposite origin v3.

Pantoporia, Hub. The Sergeants. (Plate 22).

F. Nymphalidae.—Key to genera—(*contd.*)

26 (22b). H v8 not to apex. Cells open. Eyes smooth. Palpi hairy. F upper end cell opposite far beyond origin v3; v10 ex cell or 7. H pre-costal straight.

Neptis, F. The Sailors and Lascars. (Plate 22).

27a (20b). Larva with very long horns on the head and very few processes on the body. Cells shut. Eyes smooth. H pre-costal from beyond origin v8. Palpi smooth. Antennæ equal to half costa, club slender.

27b (29). F v9 not to apex. Palpi very long.

27 (28). F v10 ex cell; vs 10 & 11 free.

Cyrestis, Bdv. The Maps. (Plate 23).

28 (27). F v10 ex 7; vs 10 & 11 anastomosed.

Chersonesia, Dist. The Maplets. (Plate 23).

29 (27b). F v9 to apex; v10 ex cell. Palpi comparatively short.

Pseudergolis, Fd. The Tabby. (Plate 23).

30a (18b). Larva spiny with many rows of spines or knobs (Melitæa). F upper end cell opposite origin v3.

30b (35a) Palpi smooth and abnormally long. Eyes smooth. Larva with 2 stout branched horns on the head. Antennæ equal to half the costa, club gradual.

30 (31a. 33a). H not tailed. F apex produced, termen rounded, but apex broadly truncate and termen concave just below.

Hypolimnas, Hub. The Eggflies. (Plate 23).

31a (30. 33a). H shortly tailed at v4 and lobed at v1. F apex sharply truncate and falcate.

31 (32). Cells closed.

Yoma, Doh. The Lurcher. (Plate 23).

32 (31). Cells open. F termen highly concave in middle and convex between vs 1 & 2.

Rhinopalpa, Fd. The Wizard. (Plate 23).

33a (30-31a). H long tail at v1 only.

33 (34). Cells open. F upper apex of cell right angled (acute in rest of group). F apex broadly truncate and concave below; convex above tornus.

Doleschallia, Fd. The Autumn Leaf. (Plate 23).

34 (33). Cells closed. F. apex sharp pointed, termen highly convex opposite v2.

Kallima, Bdv. The Oakleafs. (Plate 23.)

35a (30b). Palpi not abnormally long and usually more or less hairy.

35b (47). Claws normal and with appendages.

35c (41a). F lower dcv, if present, ends well beyond origin v3. Larva with no horns on the head.

35d (37a). F ends vs 6, 7, 8, 9 in a straight line.

35 (36). Eyes smooth. Palpi smooth. Cells open. Antennæ equal to half costa, club gradual or sharply spatulate.

Precis, Hub. The Pansies. (Plate 24).

36 (35). Eyes hairy. Palpi more or less hairy. Cells closed. Antennæ longer than half costa, club gradual, stout.

Vanessa, F. The Tortoise Shells, etc. (Plate 24).

37a (35d). F ends vs 6, 7, 8, 9 not in line, 9 well back.

37b (39a). Eyes hairy. Antennæ equal to half costa, club stout, gradual. Cell F closed, H open.

37 (38). Palpi hairy.

Araschnia, Hub. The Mongol. (Plate 24).

38 (37). Palpi smooth.

Symbrenthia, Hub. The Jesters. (Plate 24).

39a (37b). Eyes smooth. Antennæ equal to or longer than costa, club

F. Nymphalidæ.—Key to genera—(*contd.*)

abruptly spatulate. Palpi hairy.

39 (40). H cell closed. F upper end cell acute or right angled, opposite beyond origin v3; v10 ex 7 or cell. Larva spiny.

Argynnis, F. The Fritillaries. (Plate 24).

40 (39). H cell open. F upper end cell right angled or obtuse, opposite origin v3; v10 ex 7. Larva with humps.

Melitœa, F. The Small Fritillaries. (Plate 24).

41a (35c). F lower dcv ends before, at or only just beyond the origin of v3.

41b (46). Eyes smooth. Palpi with long fine hairs at the sides.

41c (44a). F v10 ex 7, v9 ends on costa and v8 behind a line joining the ends of vs 6 and 7. Larva head hornless.

41 (42a). H cell open. F origin v10 well beyond origin v7, v8 very short. Antennæ equal to half costa, club absent.

Cupha, Hub. The Rustic. (Plate 25).

42a (41). H cell closed. F origin v10 just beyond origin v7. Antennæ equal to half costa, club moderate.

42 (43). H no spur from the angle of v4.

Atella, Db. The Leopards. (Plate 25).

43(42). H with a spur from the angle of v4 towards v5.

Issoria, Hub. The Vagrant. (Plate 25).

44a (41c). F v10 ex cell, v9 ends on apex behind a line joining the ends of vs 6, 7, 8. H with a spur or fold from the angle of v4 towards v5. H cell open. Larva with or without horns.

44 (45). F lower dcv ends at or just beyond the origin of v3. Antennæ longer than half the costa, club gradual.

Cynthia, F. The Cruiser. (Plate 25).

45 (44). F lower dcv ends before the origin of v3. Antennæ equal to half the costa, slender and clubless.

Cirrochroa, Db. The Yeomen. (Plate 25).

46 (41b). Eyes hairy. Palpi smooth. H with fold in the wing from the angle of v4 towards v5. Cells closed. F v10 ex cell; v9 ends at apex behind the line joining the ends of 6, 7 , 8. Antennæ equal to half the costa, club gradual.

Terinos, Bdv. The Assyrian. (Plate 25).

47 (34b). Claws very long and without appendages. Eyes smooth. Palpi white with long thin black hairs. Antennæ equal to half the costa, no club. Cells closed. F v10 ex 7, from well beyond end cell. Larva with 2 fine horns.

Cethosia, F. The Lacewings. (Plate 25).

49a (1b). F v1 swollen. Larva spiny with 2 thin horns on the head. Eyes smooth. Palpi slender, smooth. Antennæ equal to half the costa. Cells closed.

48b (50). Posterior tibiæ and tarsi with rows of spines.

48 (49). Antennæ club sharply spatulate. Apex F not truncate.

Byblia, Hub. The Joker. (Plate 25).

49 (48). Antennæ slender, clubless. Apex F truncate.

Ergolis, Bdv. The Castors. (Plate 25.)

50 (48b). Posterior tibiæ and tarsi without rows of spines. Antennæ slender and clubless. Apex F truncate.

Laringa, M. The Dandies. (Plate 25).

51a (1a). Hindwings not channelled to receive the abdomen. Antennæ hardly as long as half the costa. Palpi sparely hairy. Eyes smooth. Wings sparsely scaled.

51 (52). Antennæ club gradual. H v7 ex 6.

Pareba, Db. The Yellow Coster. (Plate 25).

52 (51). Antennæ club short, abrupt. H v7 ex cell.

Telchinia, Hub. The Tawny Coster. (Plate 25).

F1. Charaxes.—The Rajahs. (Plate 17).

1a (7). Above tawny or chestnut. ♂ more or less toothed and ♀ tailed at v4.

1 (2a). Uph margin broadly pale greenish white, bearing a central series of black rings. Bases chestnut brown, outer half of F dark brown, bearing 2 rows of crescentic white markings.

durnfordi nicholi, GrS. (95-115). The Chestnut Rajah. Assam—S. Burma. VR.

2a (1). Uph margin not broadly pale.

2b (6). Unf costa not silver white at base.

2 (3a). ♂ upf border broad black, never with tawny spots at the apex ; ♀ with broad white discal band. Below purple tawny.

α. Upf black border immaculate, border broad, equal to one-third of the wing at the dorsum ; ♂ never with pale discal band, basal area uniform tawny with only a black bar at end cell. ♀ white discal band immaculate, reaches costa. ♂ with a tail at v4 H.

polyxena psaphon, Wd. (90-112). The Tawny Rajah. Ceylon. R.

β. As last, black border narrower. In DSF ♂ some tawny markings appear on the border upf towards tornus.

**polyxena imna, But.* (90-100). S. India—Orissa. NR.

γ. ♂ upf black border with tawny markings from dorsum to v2 or 3 ; uniform tawny with a black discal line and bar at end cell. ♀ discal band yellowish white and on inner side of border there are some pale tawny spots inwardly bordered by a lunular line ; pale discal band not quite to costa and always with 2 black spots in middle in 5 and 6. ♂ only toothed H.

polyxena hemana, But. (85-100). Mussoorie—Kumaon. R.

δ. As last, but very variable ; ♂ with several well marked varieties. ♀ discal band white and pale spots on the border mostly white. Typical ♂ with no pale band upf and uph white dots in centre of black spots along border.

polyxena hierax, Fd. (80-100). Sikkim—N. Burma. C.

♂ *v. corax, Fd.* No pale band : white spots uph on inner edge of the black spots.

♂ *v. hindia, But.* Upf pale discal band ; base fulvous and margin spotted.

♂ *v. hipponax, Fd.* Upf pale band ; base fulvous to dark, margin not spotted.

♂ *v. pleistoanax, Fd.* Upf pale band ; base dark, margin white spotted and uph with the white discal band from F continued to v3 or 4.

ξ. ♂ upf with no pale discal band ; discal line usually absent ; very like *corax*. Below darker and more variegated.

**polyxena agna, M.* (80-100). Karens—S. Burma. NR.

3a (2). ♂ upf black border narrow, bearing tawny spots reaching to the apex and inwardly bordered by a lunular dark line. ♀ never with a pale discal band ;

3 (4a). Upf apical spots not above v6. Below purple tawny.

aristogiton, Fd. (70-95). The Scarce Tawny Rajah. Sikkim—Burma. R.

4a (3). Upf tawny apical spots into 6. Below ochreous.

4 (5). Below more or less uniform and markings regular ; unf black bar mid cell macular ; unh dark discal line beyond cell more or less straight, except just beyond end cell. In WSF central band darker.

marmax, Wd. (90-120). The Yellow Rajah. Kumaon—Burma. R.

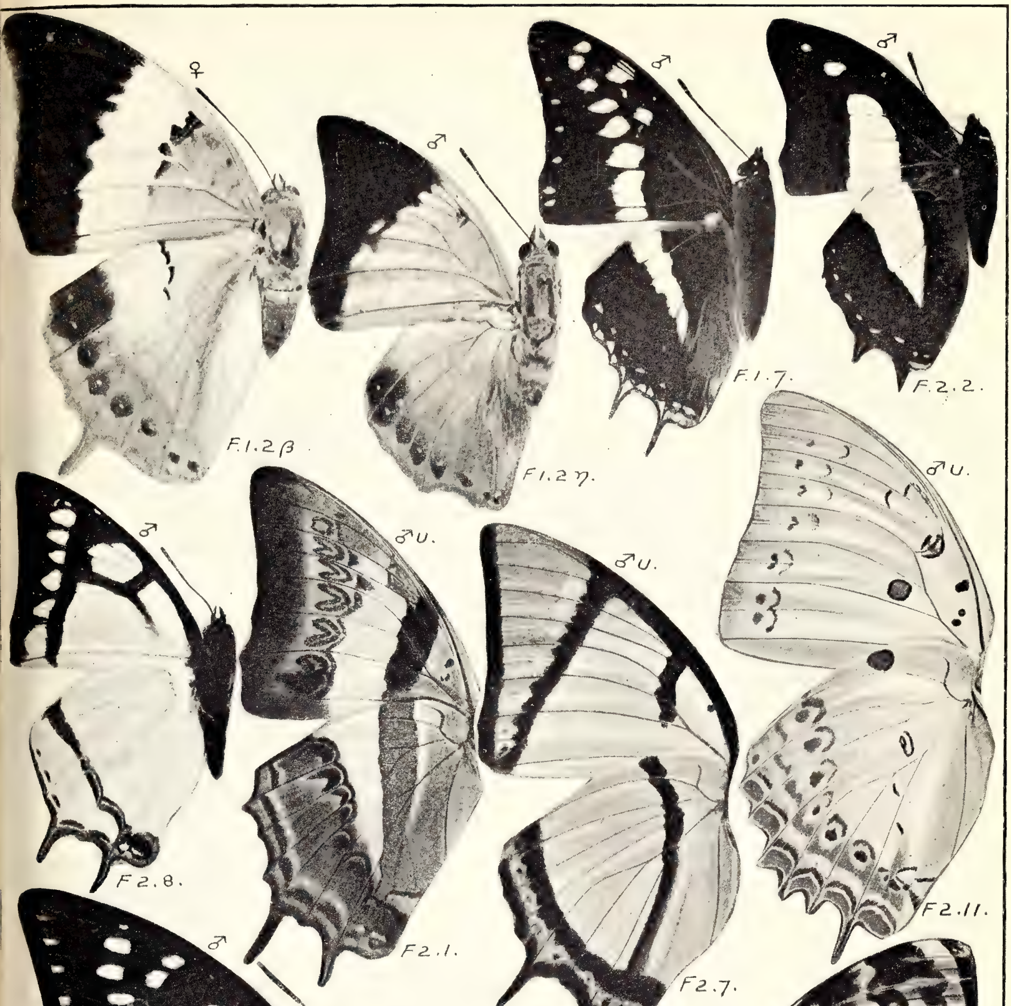
5 (4). Below markings prominent and irregular central band much darker. Unf all cell bars entire ; unh dark discal line very irregular and broken, highly concave in 6.

kahruba, M. (90-120). The Variegated Rajah. Kumaon—Burma. R.

6 (2b). Unf with a silver white bar at the base of the costa. Above much as No. 3. Below tawny.

distanti, Hon. (90-120). The Silver-edged Rajah. VR.

7(1a). Above dark brown with a yellow or whitish discal band. H long equal tails at vs 2 and 4.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F2.11
♂
U ♂
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F3.2
F3.1

F. **Nymphalidae.** 1. *Charaxes*: 2. *Eriboea*: 3. *Prothoe*.

F1. Charaxes.—(*contd.*)

a. Above pale band narrow and dark yellow.

fabius cerynthus, Fruh. (70-80). The Black Rajah. Ceylon. NR.

β. Above pale discal band wide, dark in WSF, pale in DSF.

**fabius fabius, F.* S. India—Kangra—Sikkim. NR.

γ. Above pale discal band wide and sulphur yellow; H spotting on termen wider.

fabius sulphureus, Roth. Assam—Burma. R.

F2. Eribœa.—The Nawabs. (Plate 17).

1a (4a). Above dark brown with a broad pale discal band, which does not reach the dorsum H. Uph termen with small white spots on the outer edge of the broad dark border.

1 (2a). Unh dark basal band passes through the outer half of the cell. Above discal band white, broadly blue edged.

a. Upf discal band continued evenly to v5, with 2 adjacent spots beyond in 5 and 6.

**schreiberi wardi, M.* (90-100). The Blue Nawab. S. India VR.

β. Upf discal band tapers at the upper end and just reaches 4; white spot in 5 much nearer apex and with an apical dot in 6.

schreiberi assamensis, Roth. Assam—N. Burma. VR.

γ. Upf as last, but discal band not into 4, detached spot in 5 very small and spot in 6 absent.

schreiberi tisamenus, Fruh. Karens—S. Burma. Andamans. VR.

2a (1). Unh dark basal band passes through inner half of cell. Above discal band not blue edged.

2 (3). Above discal band pale yellow, width varies greatly with the season; races only very slightly differentiated.

a. Small, band broad.

athamas madeus, Roth. (60-75). The Common Nawab. Ceylon. C.

β. Larger, usually 2 pale sub-apical spots upf.

athamas agrarius, Swin. S. India. C.

γ. Large and very variable.

**athamas athamas, Dr.* Kulu—N. Burma. C.

δ. Smaller and darker.

athamas samatha, M. Karens—S. Burma. C.

ε. Much larger and very dark.

athamas andamanicus, Fruh. Andamans. C.

3 (2). Above discal band pale greenish white. Three seasonal forms as in last and width band varies very considerably with the season.

arja, Fd. (75-85). The Pallid Nawab. Sikkim—Burma. NR.

4a (1a). Above pale yellow or greenish yellow, base H never dark; F with broad black apex.

4b (11). Unh dark discal band through basal half of cell meeting post-discal band at tornus.

4c (7a). Unf curv dark band from base through end cell to sub-marginal lunular band. Upf single pale spot on black apex.

4 (5a). Upf black margin not decreasing towards tornus.

moori sandakanus, Fruh. (80-85). The Malayan Nawab. Sikkim—Burma. VR.

5a (4). Upf black margin decreasing markedly in width towards tornus.

5 (6) Unh pale area coves more than half wing.

jalysus, Fd. (75-85). The Yellow Begum. Karens—S. Burma. R.

6 (5). Unh pale area covers less than half wing.

hebe chersonesus, Fruh. (75-85). Victoria Point. VR.

7a (4c). Unf broad bar end cell extending to base v2; sub-marginal band

F2. Eribœa.—(*contd.*)

continuous, not lunular and nearer cell.

7b (9a). Unf costa dark chocolate brown; upf single row pale spots on margin.

7 (8). Upf and Unf no broad bar from end cell towards discal band. Uph sub-marginal dark band bearing pale spots along the outer edge and blueish lunules along the inner edge.

α. Smaller and paler.

dolon dolon, Wd. (80-90). The Stately Nawab. Kulu—Kumaon. R.

β. Upf pale spots smaller and shorter.

dolon centralis, Roth. (85-95). Nepal, Sikkim, Bhutan. R.

γ. Upf spots larger than in α. Uph sub-marginal band narrow and blue lunules small.

**dolon magniplaga, Roth.* (95-105). Assam—N. Burma. R.

δ. Uph more deeply scalloped and uph blue sub-marginal lunules more prominent.

dolon grandis, Roth. (95-110). Shan States—Karens. R.

8 (7). Upf and unf broad dark bar from lower end cell along 3 to the discal band, enclosing a large pale spot beyond end cell; spots on margin increase in size to tornus. Uph with a postdiscal dark band.

α. Larger. Usually a postdiscal pale spot in 7 upf. Uph sub-terminal narrow dark bars in spaces up to 6.

**narcœea aborica, Evans.* (70-75). The China Nawab. Abor Valley. R.

β. Smaller. Upf no spot in 7. Uph sub-terminal dark bars obsolete above 3.

narcœa lissainei, Tyt. (70-75). Naga Hills. R.

9a (7b). Unf costa white and upf with sub-marginal as well as postdiscal row spots. Uph band as in No. 7. Up and unf bar from lower end cell towards discal band as in No. 8, but much shorter.

9 (10). Upf 2 pale spots end cell; dark margin becoming obsolete at tornus.

nepenthes, Gr S. (80). The Shan Nawab. Shan States. VR.

10 (9). Upf single pale spot end cell and 2 spots beyond.

α. Large. Seasonal forms differ much in size and size of spots.

eudamippus eudamippus, Db. (100-120). The Great Nawab. Kumaon—Assam. NR.

β. Upf cell all black or very nearly so.

**eudamippus nigrobasalis, Lathy.* N. Burma. N.R.

γ. As α, but smaller. Uph no blue border to band and outer white spots larger.

eudamippus jamblichus, Fruh. Karens—S. Burma. R.

11 (4b). Below no dark bands; large spots end cells, base 2 F and mid costa H; sub-marginal row reddish spots preceded by a blue line and on H followed by a greenish yellow line as well as a terminal blue and greenish yellow line. Above broad black apex bearing one or two pale spots and on H sub-terminal blueish, white centred, line.

**delphis, Db.* (95-100). The Jewelled Nawab. Assam—Burma. NR.

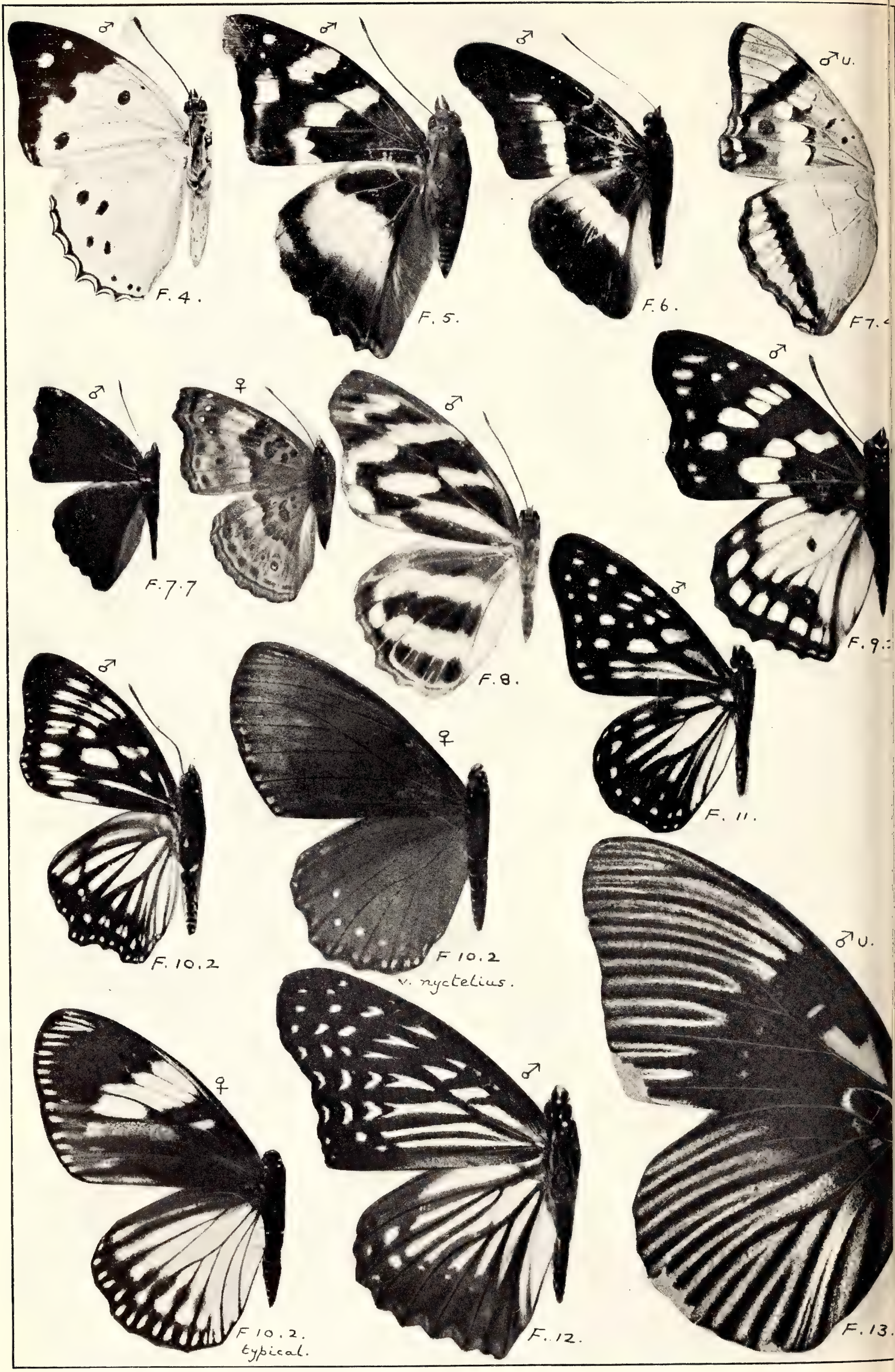
F3. Prothoe.—The Begums. (Plate 17).

1 (2). Above pale yellow, broad black apex and margins. Below variegated red and black. F lower dcv evenly curved.

**calydonia belisama, Crow.* (110-120). The Glorious Begum. Karens—S. Burma. VR.

2 (1). Above dark brown with a blue band F. Below variegated dark brown and whiteish; H with broad greenish marginal lunules. F lower dcv highly concave at lower end.

α. Upf blue band very broad and not marked with white; complete series terminal blue spots, upper 2 being white.


♂
F. 4.
♂
F. 5.
♂
F. 6.
♂ u.
F. 7.
♂
♀
F. 7. 7
♂
F. 8.
♂
F. 9.
♂
F. 11.
♂
F. 10, 2
♀
F 10. 2
v. nyctelius.
♀
F 10. 2.
typical.
♂
F. 12.
♂ u.
F. 13.

F. **Nymphalidae.** 4. *Helcyra*: 5. *Dilipa*: 6. *Eulaceura*: 7. *Apatura*: 8. *Herona*: 9. *Sephisa*
10. *Euripus*: 11. *Diagora*: 12. *Hestina*: 13. *Sasakia.*

F3. Prothoe.—*contd.*

franckii regalis, But. (70-80). The Blue Begum. Manipur, Upper Assam. VR.
β. Upf blue band narrow and centrally with white splashes; white marginal spots only in 5, 7 and 8.
**franckii angelica, But.* Karens—S. Burma. R.

F4. Helcyra.—The White Emperor. (Plate 18).

Above glazed white; upf black spots in cell and 1, broad black apex with 2 white spots; uph with a few irregular black discal spots. Below only a thin discal line of black lunules.
**hemina, Hew.* (65-75). The White Emperor. Sikkim—Burma. R.

F5. Dilipa.—The Golden Emperor. (Plate 18).

Above dark brown, ♂ with golden bronzy, ♀ with white, central and discal spots F and whole disc H; upf 2 white apical dots.
**morgiana, Wd.* (70-80). The Golden Emperor. Kashmir—Shan States. R.

F6. Eulaceura.—The Elegant Emperors. (Plate 18).

1 (2). Above transparent pale brown, with dark brown costa F and large spot in 2 as well as margins and discal band H.
manipuriensis, Tyt. (75-80). Tytler's Emperor. Manipur. VR.
2 (1). Above dark brown with a continuous white discal band, extending on F from dorsum to 3. Below as in last, glazed pale violet brown with an ocellus in 2 F and H.
**osteria kumana, Fruh.* (65-70). The Elegant Emperor. S. Burma. R.

F7. Apatura.—The Emperors. (Plate 18).

1a (6a). Unf no row of minute sub-apical white dots in 5, 6 and 8.
1b ((3a). Unf no black spots in cell.
1 (2). Upf single discal pale band, macular in ♂ continuous in ♀, in addition to the white apical spots. Above dark brown, no pale band H. Below ocellus in 2 F and H fulvous ringed; dark discal line white edged at upper end.
α. Upf discal band white. Uph ocellus in 2 prominent. Below pale brown.
sordida sordida, M. (60-70). The Sordid Emperor. Sikkim—N. Burma. R.
β. Upf discal band yellow tinted. Uph ocellus in 2 absent. Below pale greenish brown.
sordida naga, Tyt. Nagas. R.
(1). Upf 2 pale discal bands in addition to the apical spots. Unh dark discal line pale edged throughout. Above dark greenish brown; ♂ upf markings tawny and inner band crosses cell; ♀ markings white or yellowish white, inner band not crossing cell.
α. Upf outer discal band continuous. Uph mostly tawny; unh complete row postdiscal ocelli.
ulupi ulupi, Doh. (65-70). The Tawny Emperor. Upper Assam. VR.
β Upf outer discal band broken at v4. Uph ♂ only tawny in 5 aud 6; ♀ postdiscal spots well defined in 5 and 6. Below pale greenish white.
ulupi florenciæ, Tyt. Nagas. R.
3a (1b). Unf with black spots in cell.
3 (4a). Upf 2 discal bands; no sub-marginal spots F or H. Above dark brown and tawny, shot blue in ♂. Below pale tawny, prominent pale discal band unh, no sub-marginal dark band.
ilia here, Fd. (70-80). The Tawny Purple Emperor. Shan States. VR.

F7. Apatura.—(*contd.*)

4a (3). Upf single white discal band in addition to the apical spots, nearly always sub-marginal pale spots H and often on F. Below bluish white, prominent ferruginous discal and terminal band F and H, which on H meet at apex and tornus.

4 (5). Upf no white streak in cell from base. ♂ above shot brilliant blue.

α. Very large. Blue gloss duller; white markings broad and diffused; upf discal band to v11. Unh ocellus in 2 absent. Uph sub-marginal white markings very large.

ambica chitralensis, Evans. (75-90). The Indian Purple Emperor. Chitral—Kashmir. NR.

β. Smaller and all markings more sharply defined. Variable and liable to aberrations.

**ambica ambica, Koll.* (65-75). Kashmir—Shan States. NR.

5 (4). Upf with white streak in cell from base, sub-marginal spots prominent. ♂ very obscurely blue shot. Uph with white discal band from mid costa to base 1. Body prominently white banded. Very like a *Pantoporia.* (F. 25)

chevana, M. (75-80). The Sergeant Emperor. Sikkim—N. Burma. R.

6a (1). Unf prominent small sub-apical white dots in 5, 6 and 8. F end cell opposite origin v3. Club antennæ narrow. Unf prominent spots in cell.

6 (7). Above dark ochreous brown; uph with a straight yellow band; upf discal band of yellow spots, apical spots continued to 3 and a prominent black spot in 2. Eyes hairy.

parvata, M. (50-60). The Brown Prince. Sikkim—Assam. R.

7 (6). Above ♂ velvet black, unmarked except for white apical dots. ♀ ochreous brown with a paler discal band, which on H is always irregular.

α. ♂ upf with 3 apical dots.

parisatis camiba, M. (45-50). The Black Prince. Ceylon. NR.

β. As last, rather larger. ♀ paler and with pale bands prominent.

parisatis atacinus, Fruh. S. India. NR.

γ. ♂ upf single apical dot. ♀ much darker.

**parisatis parisatis, God.* Kumaon—Burma. NR.

F8. Herona.—The Pasha. (Plate 18).

Above dark brown with 2 yellow or white discal bands F and H and a basal streak in 1 F. Unf conspicuous white streak in outer half of 5 to termen.

α. Above bands tawny, very wide and confluent.

**marathus marathus, Db.* (70-90). The Pasha. Sikkim—Shan States. NR.

β. Above bands tawny and narrow; discal bands H and outer band F macular.

marathus angustata, M. Karens—S. Burma. R.

γ. As last but bands in ♂ whitish and in ♀ white.

marathus andamana, M. Andamans. NR.

F9. Sephisa.—The Courtiers. (Plate 18).

1 (2). Above dark brown with 2 tawny bands F; H tawny with black veins and a dark postdiscal band. In ♀ upf the apical spots are whitish.

dichroa, Koll. (60-75). The Western Courtier. Chitral—Kumaon. NR.

2 (1). ♂ above outer discal band and apical and sub-marginal spots white; typical ♀ mostly blue; 2nd form ♀ spots as ♂, but all white except for a yellow spot in cell and on H the tawny colour is replaced by white; 3rd form ♀ as first but with white apex upf.

**chandra, M.* (75-90). The Eastern Courtier. Sikkim—Karens. NR; ♀ VR.

♀ *v. albina, Evans.* VR.

♀ *v. chandrana, Evans.* R.

F10. Euripus.—The Courtesans. (Plate 18).

1 (2). Unh with red basal markings. ♂ H red sub-marginal spots in 1a to 3

α. Darker. H vs broader black and black discal band continued in ♂ to costa, also traceable in ♀ ; F discal band narrow.

consimillis meridionalis, WM. (60-85). The Painted Courtesan. S. India. R.

β. Pale markings broader. Uph black discal band only traceable in ♂. Unf dark discal band prominently broader at lower end.

consimilis consimilis, Wd. Dun—Dawnas. R.

2 (1). Unh no red basal markings. ♂ black with pale spots as in No 1. ♀ in several forms ; typical form with a broad white band upf and uph all white except for a narrow sub-marginal brown band.

**halitherses, Db.* (65-85). The Courtesan. Sikkim—Burma. NR.

♀ *v. isa, M.* As typical form, outer half uph dark brown. NR.

* ♀ *v. nyctelius, Db.* Upf dark brown with apex broadly suffused bluish ; uph all dark brown. NR.

♀ *v. cinnamoneus, WM.* As last, but uph outwardly with white streaks. R.

♀ *v. alcathœoides, DeN.* As *nyctelius*, but upf all dark brown. VR.

F11. Diagora.—The Sirens. (Plate 18).

1 (2). Upf black bar mid cell ; unh dorsum not yellow.

α. Paler, white markings wider.

persimilis zella, But. (65-75). The Siren. Simla—Kumaon. R.

β. Darker, white markings narrower. Apex F more produced.

**persimilis persimilis, Wd.* Sikkim—Assam.

2 (1). Upf no black bar in cell. Unh dorsum yellowish. Development of black markings very variable.

mena, M. (75). The Scarce Siren. Dalhousie—Mussoorie. VR.

F12. Hestina.—The Circe. (Plate 18).

Upf with broad black veins and spotted borders. Uph veins and border broad bright chestnut.

**nama, Db.* (95-105). The Circe. Mussoorie—Burma. NR.

F13. Sasakia.—The Empress. (Plate 18).

Above black, outer half with prominent pale streaks ; upf narrow red basal streak in cell, which unf is much wider ; unh some basal red markings below costa.

**funebris, Leech.* (125-130). The Empress. Nagas. VR.

F14. Calinaga.—The Freaks. (Plate 21).

α. Only fore part of thorax above orange. Unh dull ochreous.

buddha buddha, M. (90-105). The Freak. Murree—Kumaon. VR.

β. Darker. Unh pale brown. F more elongated.

buddha gautama, M. Sikkim. VR.

γ. Above all pale markings very reduced, sharply defined and clear, not diffused as usual.

buddha aborica, Tyt. Abor Valley. VR.

δ. All thorax above orange. Dark with the pale markings reduced. Unh pale slate.

**buddha brahma, But.* Assam—N. Burma. R.

η. All thorax orange above. Uph tornus broadly orange.

buddha sudassana, Melvill. Shan States—Karens. VR.

F15. Penthema.—The Kaisers. (Plate 21.)

1 (2a). Upf dark brown with pale yellow spots ; large basal streaks in 2 and 3. Uph cell all yellow ; sub-marginal and discal spots small, preceded by streaks.

F15. Penthema.—(*Contd.*)

α. Below reddish brown. DSF with apex produced.

**lisarda lisarda, Db.* (125-135). The Yellow Kaiser. Sikkim—Manipur. R.

β. Below dull brown.

lisarda mihintala, Fruh. Chin Hills. R.

2a (1). Upf black with a blue sheen and all spots bluish ; basal streaks in 2 and 3 replaced by spots ; all markings smaller. Uph sub-marginal spots shaped like arrow-heads.

2 (3). Uph cell with yellow streaks followed by postcellular streaks, separate from discal spots. Upf long streak in 1.

darlisa, M. (125-135). The Blue Kaiser. Shan States—S. Burma. R.

3 (2). Uph cell all black.

α Upf long streak in 1. Uph postcellular streaks conjoined to discal spots.

binghami yoma, Ellis. (125-135). The Black Kaiser. Pegu Yoma. VR.

β. Upf no streak in 1. Uph no postcellular streaks.

binghami binghami, W.M. Dawnas. VR.

γ. Upf no streak in 1. Uph postcellular streaks conjoined to discal spots.

binghami merguie, Evans. Mergui. VR.

F16. Dichorragia.—The Constable. (Plate 19).

Dark green with small whitish spots F and very prominent zigzag sub-marginal line, single in ♂, double in ♀.

**nesimachus, Bdv.* (65-85). The Constable. Kulu—Burma. NR.

F17. Stibochiona.—The Popinjay. (Plate 19).

♂ above velvet black, ♀ darkgreen ; upf white spotted and with a dull blue sub-marginal line ; uph prominent row sub-marginal black spots, inwardly blue (♀ green) bordered and outwardly white.

α. Uph width of white edging narrower than width of black spots ; wider in DSF.

nicea nicea, Gray. (60-80). The Popinjay. Kulu—N. Burma. NR.

β. Uph width of white edging twice as wide as the black spots.

**nicea subucula, Fruh.* Karens—S. Burma. NR.

F18. Euthalia.—The Barons, Counts, etc. (Plates 19 & 20).

1a (27a). Unh base with 2 spectacle marks in cell, outer one extending to base 5, small ring base 6 and a larger one base 7; these markings variable and may be obscure or absent.

1b (18a). Unf cell entirely open.

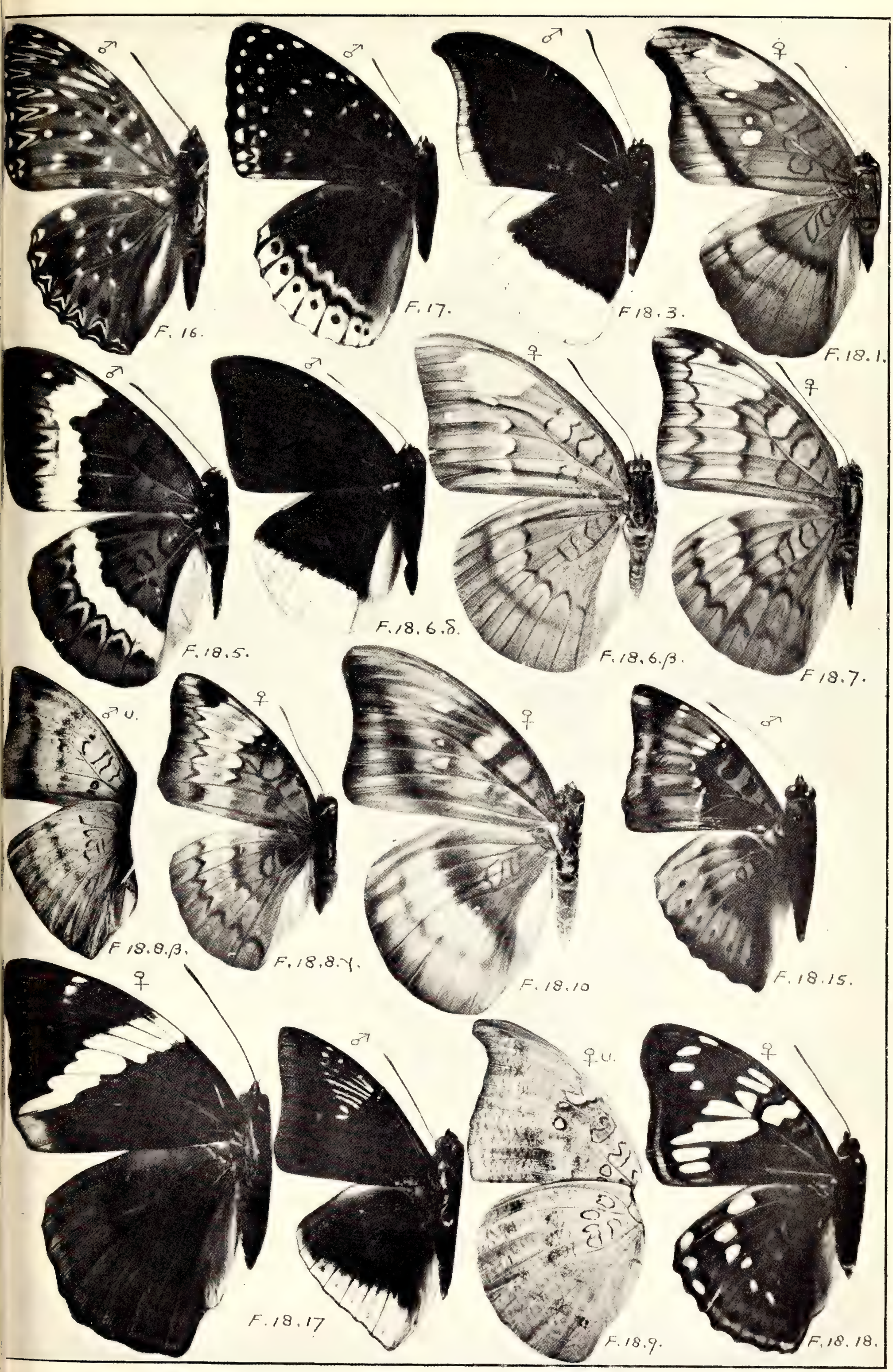
1c (4a). H termen straight to just above v3, where it is angled, giving the wing a squared appearance. F vs 11 and 12 anastomosed, 11 and 10 touch 10 & 9 ; 9 from mid 7. F prominently falcate. Uph ♂ a black brand at bases of 6 and 7.

1d (3). Unf post discal line prominent and not parallel to termen, much nearer termen at apex than at tornus.

1 (2). Unf postdiscal line quite straight. ♂ uph with a very broad lavender grey margin extending to v5 F ; upf large dark greenish spots in cell and beyond. ♀ pale brown ; upf a prominent straight black band from termen at end of v7 to outer third of dorsum, continued on H behind end cell ; upf apex greenish and with prominent elongated white spots in 5 and 6, smaller spot beyond in 6, minute spots in 3 and 4 and spot in 2. Below yellowish, margins not paler.

**cocytus, satrapaces, Hew.* (65-80). The Lavender Count. Manipur—S. Burma. NR.

2 (1). Unf postdiscal line sinuous. ♂ above nearly black with a pale blue border F and H ; unf margin bluish ; unh all dark brown ♀ above pale brown ; upf large dusky white spots in 2 and 3 and elongated spots in 5 and 6, all bordered pale dusky bluish.


♂
F. 16.
♂
F. 17.
♂
F 18.3.
♀
F. 18.1.
♂
F. 18.5.
♂
F. 18. 6. δ.
♀
F. 18. 6. β.
♀
F 18. 7.
♂ u.
F 18. 8. β.
♀
F. 18. 8. γ.
♀
F. 18. 10
♂
F. 18. 15.
♀
♂
F. 18. 17
♀ u.
F. 18. 9.
♀
F. 18. 18.

F. **Nymphalidae.** 16. *Dichorragia*: 17. *Stibochiona*: 18. *Euthalia*.

F18. Euthalia—(*contd.*)

godarti asoka, Fd. (70-80). The Malay Count. Mergui. VR.

3 (1d). Unf postdiscal line waved and parallel to termen. Sexes alike. Uph broad pale margin to v6 F. Below margins prominently paler.

a. Small; borders above very pale grey. Below clouded brown.

lepidea miyana, Fruh. (65-75). The Grey Count. N. Kanara, Orissa. R.

β. Larger; borders above pale grey.

**lepidea lepidea, But.* (70-80). Kumaon—Assam. NR.

γ. Rather smaller; borders darker grey. Below more uniform, reddish brown. ♀ upf pale brown spots beyond cell.

lepidea sthavara, Fruh. (65-75). N. Burma—Dawnas and Tavoy. NR.

δ. Borders above pale blue.

lepidea andersoni, M. (70-80). The Blue Count. Tavoy—S. Burma. NR

4a (c). H termen not angled at v3.

4 (5a). Palpi 3rd joint very long and needle like. Above rather pale brown with 2 dark, highly zigzag, discal lines filled in between with white on F. Unf outer half bluish white.

pelea, F. (70-80). The Malay Viscount. Mergui. VR.

5a (4). Palpi not long and needle like.

5b (8a). Palpi 3rd joint sharply attenuate. H termen evenly convex and wing symmetrical about a central axis from base to mid termen. Upf basal markings in 1 very wide and the ring under origin of v2 reaches v1. F venation as in last group, but origin v9 usually nearer base. Unh with black spots usually at bases 1, 2 and 3.

5 (6a). ♂ ♀ above with a broad white discal band F and H, outwardly bordered by conical black spots, which on H are surmounted by blue spots. Below pale green.

**cibaritis, Hew* (75-85). The Andaman Viscount. Andamans. NR.

6a (5). Above no continuous white band F and H; 2 dark bands parallel to one another and to the termen; these bands may be filled in between with pale colouring on F and on H may be obscured by a pale blue margin in the ♂.

6 (7). Above dark bands not conspicuously lunulated, composed more of diffuse spots.

a. ♂ uph blue margin uph to outer discal band and reaching v6. ♀ rather pale brown with whitish spots upf at the upper end of each discal band in 6. Unh ♂ tornal half green, ♀ all bluish except apex.

julii appiades, Men. (65-80). The Common Earl. Kumaon—Sikkim. C.

β. Larger. ♂ uph blue margin absent or narrow and broken. ♀ very variable, portion between discal bands upf may be entirely filled in whitish or may be as in last.

**julii adima, M.* (70-85). Khasi Hills. C.

γ. Paler and blue border uph in ♂ broader. Upf dark bands closer and in ♀ often with pale brown large spots in cell and beyond. ♀ as variable as last but smaller.

julii sedeva, M. (65-80). Sylhet, Cachar. Manipur and N. Burma. NR.

δ. As last, but blue border uph in ♂ still broader, reaches nearly to inner discal band. Above more uniform. ♀ as last, but dark bands H closer together. Unh ♂ and ♀ green or bluish over the whole wing or nearly so.

**julii xiphiones, But.* (65-80). Karens—S. Burma. NR.

7 (6). Above discal bands conspicuously lunulated. ♂ rich vinaceous brown, no blue border H. ♀ pale brown, paler between the dark discal bands, often whitish on F especially at upper end. Below ♂ yellowish brown; ♀ yellow, H more or less blueish.

. Larger.

ujahnu jahnu, M. (65-80). The Plain Earl. Sikkim—N. Burma. NR.

β. Smaller and wings broader.

F18. Euthalia—(*contd.*)

jahnu jahnita, Evans. (60-75). Karens—S. Burma. NR.

8a (5b). Palpi 3rd joint gradual. Upf basal markings never wide. Unh no or only traces of black spots at bases of 1, 2 and 3. F vs never anastomosed in ♂ and only in ♀ of Nos. 8, 9 and 10.

8b (14a). Up or unf never with 2 detached apical white spots on either side of v7, just behind origin v8, unless forming part of the pale band in the ♀. Upf basal markings in 1 consist of a well defined ring under the origin of v2, reaching mid 1 (in Nos. 8 and 10 usually a small ring or dot below) as well as a dark dot at the extreme base.

8c (10a). Unf at base 1 always a ring or round spot under origin v2 with usually a 2nd below it.

8 (9). Apex F pointed; H tornus in ♂ produced and termen convex. ♂ dark brown with broad bluish grey margin uph and discal band upf, which is very wide at its lower end; a whitish spot base 3 upf. ♂ paler brown with the usual 2 dark discal lines, as in Nos. 6 and 7, area between much paler especially at upper end F; band pushed in at base 3 corresponding to the white spot in the ♂. Below yellow and dorsal area H greenish. ♂ uph a dark brand of modified scales at bases 6 and 7.

α. ♂ small and pale; pale brown costal area more extensive; below band obscure especially in DSF. ♀ pale discal band less developed.

kesava arhat, Fruh. (50-80). The Powdered Baron. Sikkim. NR.

β. ♂ larger, darker greenish. ♀ whitish discal band more developed especially in WSF. Below darker.

**kesava kesava, M.* (55-80). Assam—N. Burma. N.R.

γ. ♂ inner side of discal band sinuous. ♀ whitish discal band very prominent, broader and edges more sinuous.

**kesava discispilota, M.* (50-70). Bhamo—S. Burma. NR.

9 (8). Apex F highly falcate and in ♂ tornus produced, termen being concave before tornus. Above ashy grey, more or less suffused greenish. ♀ with curved row small white spots beyond cell from 3 to costa.

α. Larger and more uniform. ♂ no white costal patch, but a prominent white spot base 3. ♀ upf spots rounded.

anosia saitaphernes, Fruh. (70-85). The Grey Baron. R.

β. Smaller, darker and more marmorated. ♂ upf with a white costal patch beyond cell, no spot base 3. ♀ upf spots pointed.

**anosia anosia, M.* (65-80). Assam—Burma. R.

10a (6c). Unf at base 1 no markings or only a single spot or dash under origin v2 and only very rarely a spot at the extreme base.

10 (11a). Upf cilia white at apex, which is produced, not pointed; H termen evenly convex, tornus not produced. ♂ above very dark brown, with blue margin uph, extending to v3 F. ♀ above rather pale brown, inclined broad dark brown border from apex to two-thirds along dorsum, continued on H to just beyond cell; upf 5 dusky white spots in a curved row beyond cell.

**telchinia, Men.* (70-85). The Blue Baron. Sikkim—N. Burma. R.

11a (10). Upf cilia brown throughout. ♂ tornus H produced.

11b (13). Apex F sharply pointed and tornus gently convave from apex to v2.

11 (12). Above ♂ very dark brown, broad blue margin H to v6, which inwardly bears a row of black discal spots. Upf termen broadly paler beyond the discal band, which is wide and widens at lower end; inner discal band merged into basal dark area. Below ochreous brown, H dorsal area more or less green washed; the 2 parallel discal bands prominent, on F outer one widens to dorsum, inner one curved in at upper end; H inner band continuous, diffuse and pale, outer one consists of very small spots; apex unf whitish. ♀ unknown.

mahadeva binghami, DeN. (65-80). Bingham's Blue Baron. S. Burma. VR.

F18. Euthalia—(*contd.*)

12 (11). Uph no blue border. Upf the 2 discal bands more or less separated throughout. ♂ above very dark brown, outer discal band connected in each space by a dark bar to the termen, inner band merged to dark basal area; H outer discal band prominent, inner merged to dark basal area. Below dark ochreous brown, bands as in No. 11 and apex F whitish; in DSF bands faint. ♀ paler, apex upf whitish, discal bands prominent, outer one lunular, but of small spots uph; upf row of white spots beyond cell (small in WSF, large in DSF) from 2 or 3 to costa, as in No. 10. Below pale ochreous brown, more or less washed greenish on H.

merta eriphyle, DeN. (60-70). The White-tipped Baron. Assam—S. Burma. R.

13 (11b). F apex not sharp pointed, termen slightly concave in middle only. ♂ above dull dark ochreous brown, very uniform; outer discal band F and inner discal band H very faint. Below yellow, outwardly darker and dorsal area H paler; inner discal bands faint; outer discal band fairly prominent, especially at ends; on H outer discal band of small, obscure spots. ♀ unknown.

kanda elicius, DeN. (60-70). The Yellow Baron. S. Burma. VR.

14a (8b). Up or unf always 2 detached white apical spots on either side v7 just before origin v8. Upf basal markings in 1 consist of a spot, not a ring, under origin v2 and a dash at extreme base, both may be absent. Unf spot under origin v2 may be replaced by a ring. ♂ apex F pointed and tornus H produced.

14b (17). None of the spots red.

14 (15a). Uph outer discal band of small, usually well defined and well separated, spots. ♂ with a more or less complete row of small white spots beyond cell in bases 2-6. Normal ♀ similar, but spots larger. Unf spot in 1 of outer discal band shifted in.

α. ♂ very dark. ♀ upf with a stright white macular discal band from costa beyond cell to v2 near termen. Upf apical spots obscure.

garuda vasanta, M. (60-75). The Baron. Ceylon. C.

β. Very large. ♂ basal area dark; discal spots small or absent; discal area dusted whitish. ♀ discal spots large, pure white, discal area beyond prominently dusted whitish.

garuda meridionalis, Fruh. (65-80). S. India—N. Kanara. C.

γ. Small and pale. ♂ upf discal spots small, but those beyond end cell always present. ♀ discal spots small and dusky, spots in 2 and 3 small or absent.

garuda anagama, Fruh. (55-75). Bombay—Orissa. Kangra—Kumaon. NR.

δ. Darker than last and discal spots upf smaller.

garuda suddhodana, Fruh. (55-75). Bengal. Sikkim. NR.

η. WSF dark and spots upf complete and prominent. WSF ♀ spots as in ♂; DSF ♀ spots end cell very large and confluent, spots in 2 and 3 may be small or absent.

**garuda garuda, M.* (55-80). Assam—Burma. NR.

ζ. Very large. ♂ dark and discal spots obscure, apical spots prominent and outer discal band wide. ♀ with complete discal band as in *α*, but more diffused and linked Y—wise to the apical spots; discal band continued widely on H between the dark discal lines.

garuda acontius, Hew. (65-85). Andamans. NR.

15a (14). Uph outer discal line continuous or absent, but never of well separated small spots.

15 (16). Upf white streak at termen in 7, which on unf extends into 6 and 8. ♂ above very dark brown, outer discal band broad and inclined inwards, being continued on H as the inner band. Upf beyond cell a series of double spots in 3-6, the lower one in 5 being continued as a streak so as to meet a lower spot in 6. ♀ paler and outer discal band narrower.

α. Small, pale and markings narrow.

F18. Euthalia—(*contd.*)

jama jamida, Fruh. (55-75). The Streaked Baron. Sikkim. NR.

β. Larger and darker. ♂ upf white streaks prominent above in WSF, absent in DSF.

jama jama, Fd. (55-85). Assam, Manipur. NR.

γ. As last, but smaller and never so dark. ♂ upf white streaks nearly or quite obsolete.

jama verena, Fruh. (55-80). Burma. NR.

16 (15). Upf no white streak at termen in 7. ♂ upf marked as in last, but outer discal band is parallel to margin and white streaks very prominent; uph margin broadly pale blue to v6 and termen narrowly pure white. ♀ quite different, paler brown with a broad white discal band upf from costa to termen at v1; 2 prominent apical spots.

**phemius, Db.* (65-70). The White-edged blue Baron. Sikkim—Burma. NR.

17 (14b). Above dark green with red spots H and in cell F. ♂ upf a Y-shaped discal band of small white spots and ♀ with a large white spot before end cell as well as a macular white discal band. Uph outer row dark spots sub-marginal, not discal.

a. Upf sub-marginal band much broader. In ♂ there is a strong contrast between the dark basal and the green marginal areas. ♀ outer edges of the 2 spots in 1 and lower edge spot in 2 not to termen, in line with spot in 3.

lubentina psittacus, Fruh. (65-80). The Gaudy Baron. Ceylon. NR.

β. ♂ above nearly uniform dark green, but paler than other races. ♀ more brilliant pale green, upf band narrow and sharply defined.

lubentina arasada, Fruh. (60-80). S. India.

γ. Dark and uniform. Considerable seasonal variation.

**lubentina indica, Fruh.* Bombay—Bengal. Kangra—Burma.

18a (1b). Unf cell closed or at least with a small spur from base of v5. Mostly dark green.

18 (19a). Upf a sub-marginal row white spots; white discal band to just beyond mid dorsum and on H to v2. Below shining pale greenish blue. F cell not fully closed. Upf and unf no basal markings in 1.

a. Above white discal band broad and all markings slightly diffused.

franciæ franciæ, Gray. (75-90). The French Duke. Sikkim, Nepal, Bhutan. R.

β. Above white discal band narrow and all markings sharp.

**franciæ rajah, Fd.* Assam—Karens. R.

19a (18). Upf no row of sub-marginal white spots. F cell closed.

19b (26). Apex F not falcate; no red spot in cell upf. Usually prominent pale discal band upf. Upf at base 1 a ring and a dot usually under origin v2.

19c (21a). Upf white discal band vertical, reaches dorsum just beyond middle; on H discal band to v1 and outwardly bordered bright greenish blue. H cell open; F vs 11 and 12 anastomosed.

19 (20). Uph white discal band not black edged outwardly before the blue area.

duda, Stg. (90-100). The Blue Duchess. Sikkim—Assam. R.

20 (19). Uph white discal band outwardly black edged.

a. Uph blue area not formed into lunules except near costa.

**durga durga, M.* (95-105). The Blue Duke. Sikkim—Abor. R.

β. Uph blue area formed into blue lunules throughout. The discal band upf and all the markings below broader.

durga splendens, Tyt. Nagas. VR.

21a (17c). Upf white discal band, if present, directed to tornus and not extending below v2. Cell H shut; Fv11 free.

21 (22a). ♂ above bronzy olive green, no white discal band; upf large dusky pale spots in 2 and 3; uph prominent yellow area in 6 and 7. ♀ upf with a rather narrow white discal band, spot in 4 narrow, elongate, pointed and well separated from the spots on either side.

F18. Euthalia—(*contd.*)

**nara nara M.* (70·95). The Bronze Duke. Sikkim—N. Burma. R.

β. Above bright dark green, *nara shania, Evans.* Shan States.

22a (21). ♂ upf with pale discal band; ♂ ♀ with spot in 4 conjoined to spots on either side.

22 (23a). Uph ♂ ♀ continuous curved discal band from costa to v4; upf discal band narrow and dusky at lower end, upper spots small, that in 4 smaller than the rest. Above shining bronzy olive green.

curvifascia, Fd. (75-95). The Naga Duke. Nagas. Manipur. VR.

23a (22). Uph discal band macular and upf spot in 4 as large as the rest; discal band in the ♂ pale yellow, in ♀ white usually.

23 (24a). Upf discal spot in 4 so placed that its inner edge is in line with the inner edge of spot in 5 and against the middle of the spot in 3.

α. ♂ uph the discal spots extend to 1 and beyond the spots in 5 and 6 the wing is conspicuously paler, showing up the very broad postdiscal dark band.

sahadeva sahadeva, M. (80-105). The Green Duke. Sikkim—Bhutan. NR.

β. Darker. ♂ uph discal spots at most only to 2. ♀ uph usually only spots and in 6 & 7 and often none at all.

**sahadeva nadaka, Fruh.* Assam—Manipur. NR.

γ. Smaller, paler and with a less bronzy hue. All spots smaller and paler.

sahadeva narayana, GrS. N. Burma—N. Shan States. NR.

24a (23). Upf discal spot in 4 so placed that its inner edge is in line with the inner edge of the spot in 3 and opposite the middle of the spot in 5.

24 (25). Uph all spots well separated; upf all spots very large and with their outer edges pointed.

iva, M. (115-125). The Grand Duke. Sikkim—Manipur. VR.

25 (24). Uph spots in 6 and 7 at least contiguous; upf spots more or less blunt.

α. Upf no white spots in 1; upf discal band yellow in ♂ and white in ♀.

patala patala, Koll. (85-105). The Grand Duchess. Murree—Nepal. NR.

β. Upf or unf 2 small white spots in 1. Upf discal band yellow in ♂ and ♀, all spots elongated. Below paler and spots on H more complete.

patala taooana, GrS. (100-120). Manipur—Karens. R.

26 (17b). Apex F falcate. Upf red spot in cell. Above no white band. Upf no markings base 1. Cells shut.

α. ♂ dark, ♀ paler, olive green, basal areas darker.

evelina evelina, Stoll. (75-100). The Redspot Duke. Ceylon. R.

β. ♂ shining green; upf with a white costal patch beyond cell; ♀ paler, the whole discal area between the basal and dark marginal area is whitish.

**evelina laudabilis, Swin.* S. India. R.

γ. Above brown.

evelina derma, Koll. Assam—S. Burma.

27a (1a). Unh with 2 spots in cell, which may be reddish and no markings in 5, 6 and 7.

27 (28a). Above tawny orange with black markings. Cells open.

**nais, Forst.* (60-70). The Baronet. Ceylon. S. India—Dun—Sikkim. NR.

28a (27). Above brown, with a white band or spots. Cells faintly closed.

28b (30). Uph white spots in 6 and 7 not conspicuously far larger than the rest. Upf and uph a complete discal band (except ♀ of No 29 *β*) ending on F just beyond mid dorsum.

28 (29). Upf upper spot of discal band in exact line with rest. Uph 1 or 2 small red tornal spots.

recta, DeN. (65-85). The Redtail Marquis. Assam—Burma. R.

29 (28). Upf upper spot of discal band shifted in. Uph red tornal spots.

α. Below pale ochreous brown. Upf discal band decreasing slightly, but evenly, to costa. Sexes nearly alike.

F18. Euthalia—(*contd.*)

**teuta teuta, M.* (65-85). The Banded Marquis. Assam—Arracan. R.

β. ♂ as last but discal band much narrower and uph postdiscal black spots usually joined to form a lunular line. ♀ very variable: upf discal spots may be small and complete, increasing in size to costa, or some or all may be absent, being sometimes replaced by black spots; uph similar, but the discal spots never below v4. Ground colour in ♀ may be pale or dark brown and the area between the 2 discal rows of spots upf may be greenish blue. Below pale lavender grey to ochreous brown.

**teuta gupta, DeN.* Dawnas—S. Burma. VR.

γ. Below pale glazed violet brown. Above as *a* in both sexes, but upf in ♂ spot in 5 very small; ♀ spots at upper end of discal band very large and at dorsal end very small, spot in 1 double.

teuta teutoides, M. (65-90). Andamans. R.

30 (28b). Uph spots in 6 and 7 very large and contiguous. Above rather pale brown; upf with 2 discal spots in 1, one in each 2, 3 and 6; a spot in mid cell flanked white on either side. Uph small white spots in 1-5 directed to mid dorsum and not to tornus as usual.

**dunya, Db.* (85-100). The Great Marquis. S. Burma.

F19. Adollas.—The Archdukes. (Plate 20.)

1 (2a). Palpi below greenish brown in ♂; whitish in ♀. Antennæ black above. ♂ upf velvet black with a few whitish spots in and beyond the cell; ♀ with numerous white spots. Below indigo blue at base F; apex F and all H dark green; spots white.

cyanipardus, But. (110-135). The Great Archuduke. Assam—Karens. R.

2a (1). Palpi below reddish brown.

2 (3). Antennæ black above. Below ♂ ferruginous brown.

α. ♂ upf practically unspotted and the blue border vestigial; uph blue border narrow and mostly purple. ♀ above spots bluish white; below ochreous brown and H hardly or not at all green washed; upf spots at bases 2 and 3 large.

khasiana khasiana, Swin. (80-105). The Dark Archduke. Assam. NR.

β. ♂ upf markings more developed, uph blue border broader and mostly blue, turning to green at the tornus. ♀ spots pale yellow upf and dark yellow uph.

**khasiana intermedia, Tyt.* Manipur, NR.

3 (2). Antennæ prominently yellow tipped above. Below ♂ pale ochreous brown. ♂ blue border upf broad and small spots in and beyond cell prominent, yellow; uph blue margin very broad, blue at upper end, green at tornus. ♀ all spots yellow; upf spots at bases 2 and 3 small.

**dirtea jadeitina, Fruh.* (80-105). The Archduke. Manipur—Burma. NR.

F20. Parthenos—The Clipper. (Plate 21).

Above some shade of green with very large discal white spots F; uph on disc the veins are black and there are 2 black lines between each vein, followed by a series of sub-marginal black markings.

α. Above pale greenish grey; F white spots very large; uph sub-marginal markings consist of narrow flattened lunules.

**sylvia cyaneus, M.* (115-130). The Clipper. Ceylon. NR.

β. Above greenish golden; F spot end cell as large as spot in 3. Uph sub-marginal markings are conical spots, heads rounded.

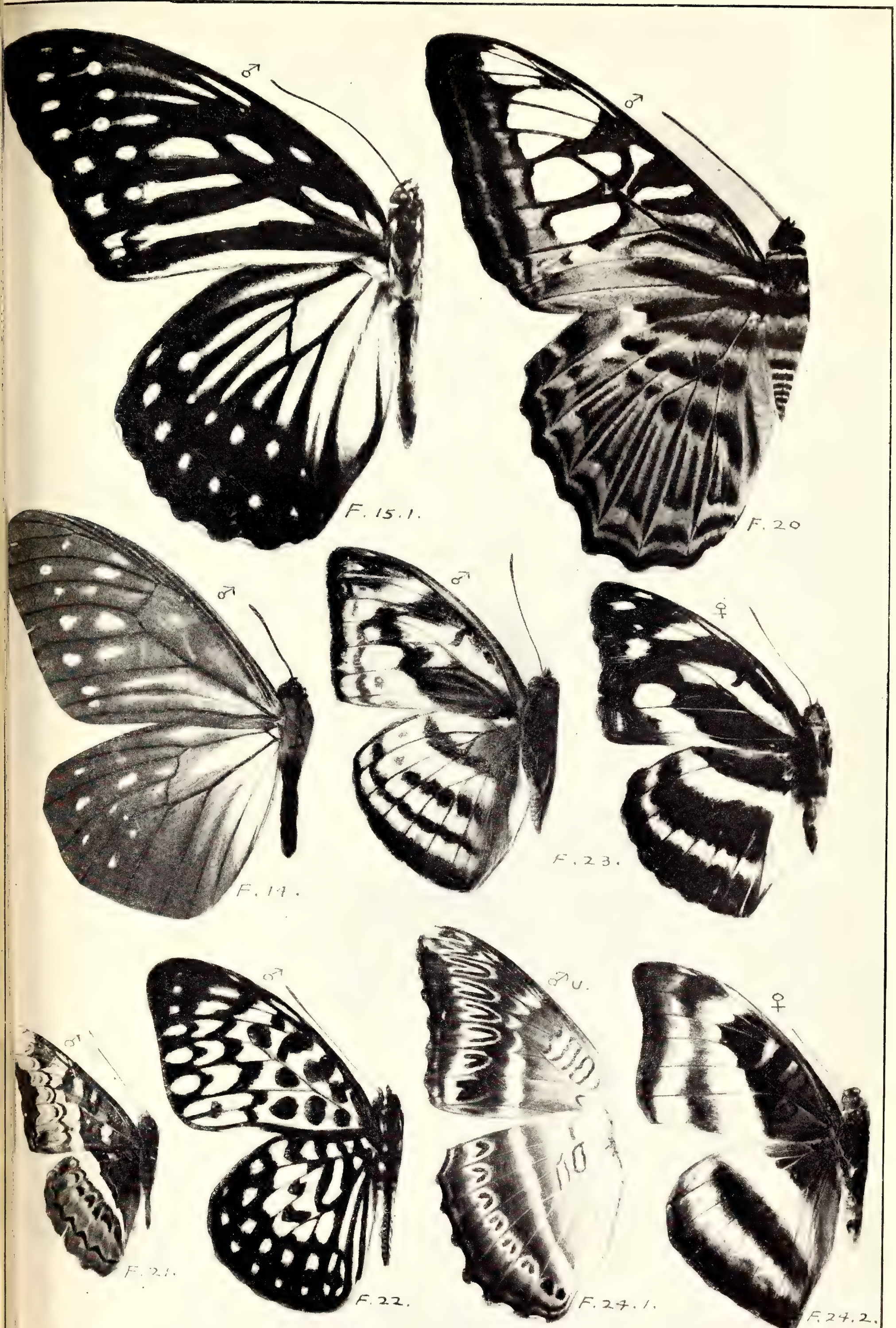
sylvia virens, M. (105-125). S. India. R.

γ. Above rather pale bluish green. DSF upf with the apex whitish and the white spots more contiguous.

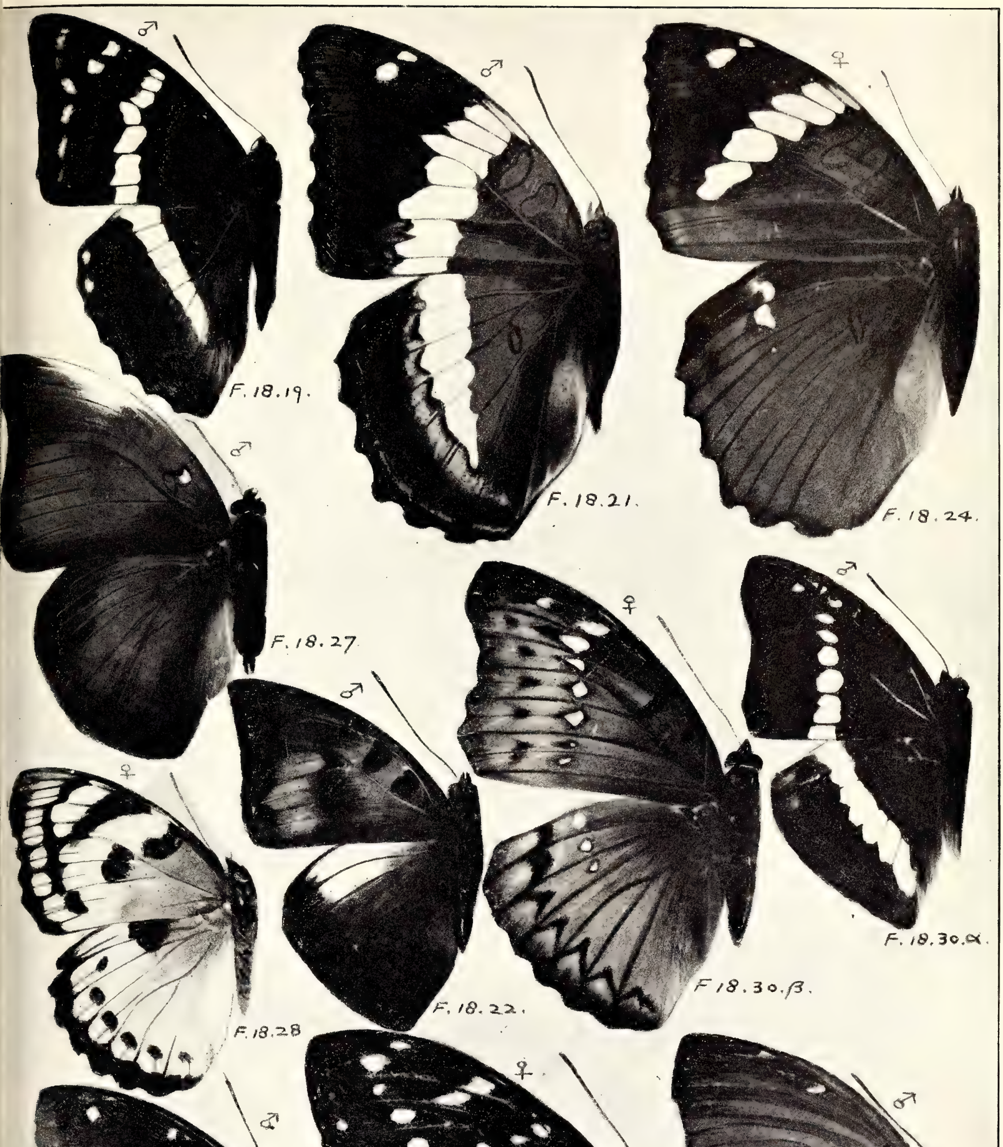
sylvia gambrisius, F. (95-110). Bengal—Burma. NR.

δ. Above moss green, below paler; upf apex white tipped.

sylvia rœpstorfii, M. (95-110). Andamans. NR.


♂
F. 15. 1.
♂
F. 20
♂
F. 14.
♂
F. 23.
♀
♂
F. 21.
♂
F. 22.
♂ u.
F. 24. 1.
♀
F. 24. 2.

Nymphalidae. 14. *Calinaga*: 15. *Penthema* : 20. *Parthenos* : 21. *Lebadea* : 22. *Neurosigma*
23. *Abrota* : 24. *Liminitis.*


♂
F. 18.19.
♂
F. 18.21.
♀
F. 18.24.
♂
F. 18.27
♀
F 18.30.β.
♂
F. 18.30.α.
♂
F. 18.22.
♀
F. 18.28
♂
F. 19.3.
♀
F. 19.2.
♂
F. 18.31.

F. **Nymphalidae.** 18. *Euthalia*: 19. *Adolias.*

F21. Lebadea.—The Knight. (Plate 21).

a. Larger, bands above broader; upf inner edge spot in 2 vertical; uph discal band fills base 3.

martha martha, F. (62-75). The Knight. Sikkim, Nepal, Bhutan. NR.

β. Smaller, not so bright and bands narrower; upf inner edge of spot in 2 curved; uph discal band just enters base 3 in ♂ only.

martha ismene, Db. (60-70). Assam—Manipur. NR.

*. Still smaller and bands very narrow; uph band not entering base 3 at all.

martha attenuata, M. (55-65). Burma. NR.

Note.—Numbering on Plates 19 and 20 under Genus F. 18. to be altered thus:—15 to 14 : 17 to 16 : 18 to 17 : 19 to 18 : 21 to 20 : 22 to 21 : 24 to 23 : 27 to 26 : 28 to 27 : 30 to 29 : 31 to 30.

THE RED ANT.

BY

Major R.W.G. Hingston, I.M.S.

(*Continued from page* 693 *of this volume.*)

Part III.

SPECIAL SENSES AND INSTINCTS.

(*With one text figure.*)

Sight—Hearing—Taste—Touch—Smell—Directive sense—Experiments on directive sense—Communication of danger—Establishment of rest camps—Construction of bridges—Enemies of red ants—Seasonal activity—The Queen—Duties of diminutive workers—Nakedness of larvae—Economic position of ant—Order in the commune.

I come now to the consideration of the special senses by which these ants are guided in their daily toil. They have a highly developed faculty of vision, far superior to that possessed by the generality of ants. Some species seem to distinguish only light from darkness, others are totally blind, but the red ant can recognize different objects, fixing them with its coal—black eyes.

I make some simple experiments on one of their workers. I move a stick across its line of vision; its attention is aroused; it points its antennæ in the direction of the stick, and with them follows each successive movement as I transfer the object from place to place. Certain other kinds of ants would have taken no notice, but this species easily detected the movement over a distance of six inches or more. Such superiority of vision must be important to an ant which spends most of its existence wandering in the trees. It is by means of this sense that they communicate danger, that they detect their enemies and the movements of their prey, and that they calculate the spaces in the midst of the foliage across which they may have to climb. They have a peculiar habit of erecting their antennæ and of giving their abdomens a sudden flick when their attention is momentarily aroused. This permits us to determine the extent of their vision and the particular service that it is to these ants. They noticed the vibrations of the blades of a forceps held four inches away, and I think that they could detect the movement of my hand at a distance of five or six feet.

As is usual in the case of other kinds of ants, I could find no indication of any auditory sense. I fired a shot from my collecting gun six inches from their line of march. There was no disturbance, no interruption in the even regularity of their course. I repeated the experiment near the entrance to a byre. A few on the exterior seemed to appreciate the shock; it was unlikely that they actually heard any sound, more probably they observed the sudden jerk resulting from the sharp recoil. I also blew a whistle within three inches of the byre, but I could not see that it had any effect on the ants. Certainly their sense of hearing must be extremely slight, if indeed it exists at all. They are very sensitive to intrusion when employed in their byres, and if they had heard the noise of the gun or whistle they would surely have poured through the gates of the chamber in their usual tumultuous swarm.

Ants, which are so fond of sweet limpid fluid, are certain to possess some sense of taste. See the way they heap themselves around a spoonful of syrup and there will be little doubt that they enjoy the flavour of the food. On the contrary they are nauseated by the juices of the *Monophlebus*; when some of the substance gets into their mouths they try to brush out the unpleasant taste. I induced some of them to sip a solution of quinine. They became agitated, ran a little distance to one side, tried to cleanse their mouth-parts with their fore legs, and were clearly much discomfited by the bitter substance which they had so foolishly tried to devour.

Of course they possess a sense of touch, that common attribute of all living matter in every form and shape. But in addition to the grosser tactile appreciations, they are very sensitive to the effect of a thrill, clearly perceiving the sudden vibrations which follow a sharp tap upon a branch. Yet they are able to discriminate with some nicety in this matter, for they do not confuse such adventitious tremors with the natural vibrations which occur in a wind or the beatings of the drops of rain.

Like other ants, which move in long columns or processions, they recognize their road by the faculty of smell. Without some guide they could not accurately follow one another in their long journeys in search of food. I rubbed my moist finger across the track while the workers were moving in a continuous stream. A considerable disturbance immediately followed. The steady flow of labour ceased, and a barrier appeared to intercept their course. When the workers reached the line made by my finger they were brought to a sudden halt. They were disconcerted, they sprang backward, they attempted again to make an advance, but their progress was as completely checked as if they had come face to face with a wall. The blockage, however, did not last very long; some of the workers made little lateral explorations, managed at last to find their way across the gap and picked up the scent on the opposite side.

I placed a small lump of camphor on their track as they advanced along the branch of a tree. There was an immediate interruption in the regularity of their march. Many of the workers came to a halt, their sense of sight being, no doubt, affected in addition to that of smell. They gathered in a ring around the strange obstruction; had it been a piece of stick they might have tried to shift it, but they perceived the unpleasant odour of the camphor and kept a safe distance away. I placed a nodule of the substance on the outside of a nest. It caused no particular flurry or excitement. The ants just quietly withdrew from the area so as to leave an open space around the lump. I then removed the camphor and the ants immediately re-occupied the ground. I tried them in the same way with the oil of eucalyptus and the aromatic oil of aniseed. But the ants appreciated the odours of these fluids and withdrew from the unpleasant smell.

It is natural to inquire how these streams of ants can find their way amidst the branches of the trees. They do not march in a haphazard manner, just wandering aimlessly as inclination moves them; on the contrary each individual stream has its own established course. The procession, after leaving a particular chamber, keeps to a fixed path. It bends and turns from one branch to another; it meets and coalesces with adjacent streams; for some distance they may move in a common flow, but at length the first stream leaves the main current to follow its own special course.

How is it that each of these living streams is not lost in the innumerable turnings of its path? I have already shown that by scent they recognize their road. But this, I feel sure, is not their only guide. For when the minor streams from the branches, after blending into the main stream, come to the point where they have to separate again, then, if they just kept to a scented road, they would naturally follow the main current instead of unerringly turning from the path. I established a bridge about one foot in length between a branch and one of their byres. The ants soon learnt to make use of the structure, since I blocked their alternative route. I removed it as soon as they had grown accustomed to the change, and replaced it immediately by a similar bridge over which no ants had previously crossed. I anticipated that the ants would have been very much at loss owing to the removal of their scented road. But they did not show extreme discomfiture. After the usual display of hesitation and excitement they made their way along the new bridge and did not seem very inconvenienced by the change. It would, therefore, appear that they had some other guide in addition to the faculty of smell.

Can it be that sight is a supplementary aid ? These ants, as we have learnt, have strong visual perceptions. Perhaps by the inspection of the objects on their route they know that they are on the true road. At a point where a branch divided into a fork there was a choice of courses open to the ants. They could take the road to the right which would lead them to their byre, or the one to the left which would lose them in the leaves. There was a steady stream along the road to the right since the ants at the time were busily engaged in transporting cattle to the shed. I surrounded this road with a white strip of cloth, fixing it one inch from the bifurcation of the branch. I left it in position for twenty-four hours. The ants had by then become accustomed to it, and, as it was a very conspicuous object, they must surely have fixed it as a landmark on their path if they were guided at all by sight. I removed it from its place on the next day, and at the same time transferred it to a corresponding position on the road that led to the left. Now, if the ants were in any way directed by sight, they ought to have thought themselves on the wrong track when they found that their landmark had disappeared. Also they might have seen it on the path to the left, and, as a consequence, have turned in that course. But the facts were otherwise. The disappearance of the cloth did not confuse the ants. They continued to take the road to the right with the same deliberation as before. The ants, in their power to recognize the road, are not guided by the faculty of sight.

Sight being, in this way, placed out of account, and smell being, at best, only a partial influence, we are forced into the idea of a directive sense, some faculty of feeling the true direction in a manner unintelligible to us. The following experiment will indicate what I mean. I arranged two sticks like the letter T (see diagram) and trained the ants to move along them in order to reach their byre. There was a pivot at the junction of the two limbs of the T, so that the horizontal one could freely rotate on the vertical one by turning it to either the right or left. I allowed the apparatus to remain in position for two days in order that the ants might become accustomed to the route.

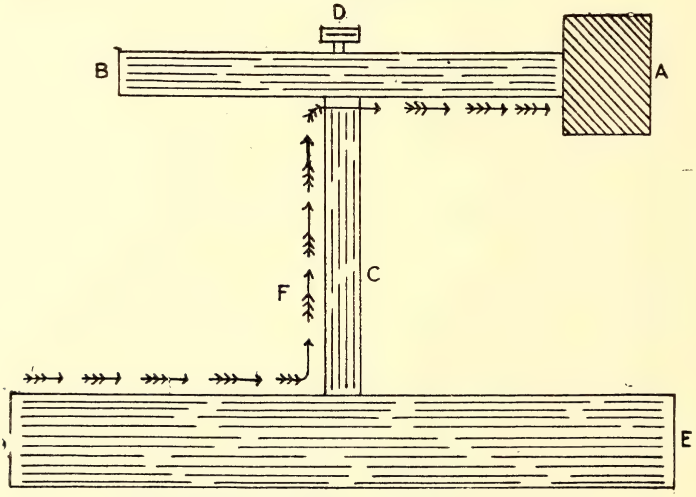


Diagram of experiment on directive sense.

a. Byre.
b. Horizontal limb.
c. Vertical limb.
d. Pivot.
e. Branch of tree.

The arrows indicate the track of the ants.

The illustration will indicate the direction of their course. They had first to ascend the vertical limb, then make a rectangular turn, then advance along the right half of the horizontal limb at the end of which they found their byre. When they were perfectly familiar with the direction of the route I thoroughly purified the left half of the limb in order to deprive it of any trace of scent. The right half was now scented and led to the byre, the left half was unscented and ended blindly in the air. The train of ants was moving along the right half on their way to and from the byre. I now rotated the horizontal limb so that the portion which previously led to the left now became the road to the byre. The point which demands attention is this. What will the ants now do when they reach the top of the vertical stick ? How will they turn, to the right or to the left ? If to the right, then it is clear that they are guided by the sense of direction, for that is now the unscented side and it is in the direction of their previous course. If to the left, then they must be guided by the sense of smell, for it is on that branch of the limb that they previously travelled and it therefore retains the scent. I take note of twenty successive workers on their journey from the tree to the byre. Nineteen of them turn without hesitation to the right and proceed direct to their goal; only one happens to go astray by making its turn to the left. Two out of the nineteen certainly hesitate and first move an inch or so to the left, but this, I think, is of little significance, for the ants do the same in their ordinary journeys ; they frequently appear a trifle confused at points where the branches join, and will run a few paces in a wrong direction before following the true road. Thus the conclusion appears to be clear. The ants are under a powerful directive influence; it is infinitely superior as a guiding force to the more intelligible faculty of smell. It is this force which mainly directs their journeys. The scent may help to keep them to the general track, and to distinguish a branch which has been traversed by the workers from one over which none have moved. But their essential guide is the directive sense, that feeling that they must turn in a certain direction in order to follow the correct road. And we have seen how powerful this sense must be, how far superior it is to the faculty of smell, for when the ants have to chose between direction and scent, then direction easily wins.

This sense of direction seems most highly developed in those species of ants which frequent the trees. I have elsewhere shown its force in the case of the black ant, how it guides the workers in their ascents to the foliage and back again to the formicary on the ground. Its exceptional development in these arboreal species is most probably related to the widespread journeys which such ants have to make through the midst of the tree. They traverse each branch, investigate each twig, thoroughly search the whole canopy of foliage in their ceaseless explorations for food. In these complicated journeys they are always changing their direction, ascending one branch, descending another branch, now turning one way, now in an opposite way, always altering their line of progress, yet when it comes to making the return journey, they never lose the road. It seems a kind of feat of directive memory, yet how can they keep in mind each separate turn in the complexity of the ever-changing route. At least we can realize the value of the sense to ants with habits such as these. It is beyond our powers to feel its influence ; we can only observe the manner of its work. Yet we can see its great power as a guide in the labyrinth, and must regard it as another of those feats of wonder performed by the hymenopteron brain.

The capacity to communicate the presence of danger is a common characteristic of a community of ants. In some species it is more highly developed than in others, and in the *Œcophylla* we observe it in a refined degree especially in regard to the defence of the nest. I have elsewhere supplied instances of its manner of occurrence and have shown how it takes place through the medium of the antennæ by virtue of the sense of touch. Alarm an ant in a *Messor* nest and the following sequence occurs. The alarmed ant runs excitedly about; it meets a comrade, they touch antennæ, the second is imbued with the enthusiasm of the first, in the same way the information is transmitted to others, and soon the whole of the *Messor* nest is a bustling excited swarm. The point that deserves our attention here is that the information is transmitted from individual to individual through the medium of the sense of touch.

I think that it is otherwise with these arboreal ants and their far more spirited defence. There is no doubt as to their capacity to distribute information whenever a particular occasion requires. Anyone who has intruded too close to the nest will be satisfied with the truth of this. But the difference lies in the manner of communication, which takes place, I believe, in this arboreal species through the medium of the sense of sight. Alarm one of these *Œcophylla* workers. It does not, like the *Messor*, immediately run away in order to touch antennæ with the first comrade that it meets. On the contrary it more often fixes itself to one spot; there it remains on the alert watching for the slightest movement to occur. It assumes a characteristically expectant attitude. It stands still, raises its head, erects the fore part of its body, straightens out its long antennæ and holds them rigidly at full length. Then it throws itself into a quivering movement; it elevates its body in sudden jerks; it rapidly vibrates the points of its antennæ; it quickly raises and lowers its abdomen so as to give it a kind of instantaneous flick. The worker, in this way standing erect, makes its whole body as conspicuous as possible while it quivers with these sudden jerks.

Now what is the meaning and purpose of this? I think that the peculiar quivering motion is a signal to the other ants in the community that danger has arrived in the vicinity of the nest. These ants, as we have seen, possess excellent vision, and it is motion even more than the actual object which they can so readily detect. Therefore, when one ant elevates itself and throws its body into jerks, those in the vicinity see the movement and immediately vibrate in the same way. Others see them, and thus almost in a moment, as fast as the faculty of vision permits and far more rapidly than by tactile communication, the news of danger is widely spread. The whole community is quickly aroused and the army is ready for the attack.

I once had a nest under close observation; it had been broken from its place on the branches of the tree and its walls had become withered and dry. Nevertheless the ants still occupied the interior, and I noticed that, when they happened to be alarmed, a sharp and tapping noise was audible, a kind of hammering on the desiccated wall. On further investigation I came to the conclusion that this was a peculiar mode of communication by means of which the outside workers signalled to their comrades in the interior of the nest. We have seen their attitude in the face of danger, and how they raise and lower their abdomens so as to jerk them sharply in the air. It was by means of this sudden abdominal movement that the workers were able to produce the noise, for the abdomen, when it fell with a sudden jerk, often came in contact with the leaf and resulted in a sharp tap. It was a special device to permit of communication between opposite sides of the wall. When danger arrives in the vicinity of the formicary all the workers are on the alert. Those on the exterior are instantly aroused, since each can see the vibrations of the other and the information, as a consequence, can rapidly spread. But the main army is in reserve in the interior of the formicary; it cannot see the angry thrill, and, as a consequence, some special device is necessary to summon it from the leafy walls. The device is simple and highly efficient. The outside workers strike the wall with a sharp and sudden tap; the signal is received by those in the interior; they realize that danger of some kind approaches and the ferocious army comes pouring through the gate.

Can we reconcile this conclusion with the previous observations that the ants have no auditory sense? If they are unaffected by the report of a gun, how can they be sensitive to these gentle taps? It is not, I believe, that their hearing is affected; they perceive the vibrations rather than the sound. It is their sense of touch which, in reality, is excited; they literally feel the delicate thrills which spread through the leafy wall.

Another point which I observed with respect to these ants was the fact that they establish a series of rest-camps at intervals along their line of march. Think for a moment on their industrious toil and we can scarcely deny them the necessity of rest. Consider their tireless and energetic nature, the burdens they carry, the victims they overcome, their ceaseless search for prey and provender, the impetuous manner in which they enter into battle, and their labour which never ceases day or night. These are examples of a busy life which must demand its periods of rest.

The ants gain some little repose from their labours as they journey from place to place. As a rule they do not halt in their onward progress while they traverse an unobstructed branch. Here and there one may turn from the main stream, moving to one side of the general current, and may there rest by itself for a little while and soon march on again. But the spot more usually chosen for their rest is the place where two branches join. Here, at the fork, they congregate in a body, often such a number at the same time, that I cannot but compare these selected places to rest-camps along their route. A few may collect where the smaller branches join, but it is usually at the junction of the main limbs that they establish the most populous camps. They choose such places for a special reason. If a number were to halt in the main road they would certainly impede the movement of the stream, but where the branches join there is more space available; there they can easily gather to one side without in any way obstructing the road. In a large camp there may be fifty or more workers collected, and at many of the junctions of the smaller branches three or four may be seen taking their rest. Most of them appear to be empty-handed, others are replete with juice. Occasionally one arrives with a larva as its burden or with a coccid fixed between its jaws. It is obvious that they are enjoying a well-needed rest. They remain quite stationary, fixed to the bark. Even the ceaseless tremblings of the antennæ have temporarily died away. Almost all of them hang with their heads turned downward, this being apparently the most restful attitude which these ants are able to assume. A halt for a minute or two seems to satisfy their needs. The encampment is in a state of continual change. Those which have rested are moving off and others are taking their place. What burden is equal to the labour of these ants? Their life is one of continuous effort, unceasing night and day They have no relaxations as we understand them; the most they can hope for is an occasional rest in one of their established camps.

Lord Avebury, in his delightful record on ants, expresses surprise at the inability of these insects to make a short drop through the air in order to reach some object below. Thus in one instance they made a journey of nearly seven feet rather than drop only half an inch. At another time they abandoned their precious larvae, though if they had allowed themselves to fall three-tenths of an inch they could easily have gained their ends. But Lord Avebury's ants were inhabitants of the soil; he would have arrived at a different conclusion had he investigated these arboreal kinds. For they are so excellently adapted to a life amidst the branches that they are able in a highly efficient manner to make their way across an empty space. On an island standing in a basin of water I established a branch of a mango tree with one of these nests attached. It was a very vigorous and populous colony, and the ants every evening displayed great activity, spreading themselves over all parts of the branch. I imagined that the colony was safely marooned, that the ants could wander freely about their island, but could not manage to effect an escape unless they crossed the watery moat. But I did not realize the efficiency of the ants and their admirable powers of resource. On the second evening of their captivity they became very restless; they were clearly discontented with the closeness of their prison and wished to spread themselves abroad. They repeatedly explored their narrow surroundings and thoroughly searched the whole of the branch in their efforts to effect an escape. Now, in one place a leaf happened to droop to within two inches of the ground. On this leaf a number of the workers had collected; the colony seemed to have concentrated on this most dependent point; it was obvious that they could see the ground beneath, and many of them stretched down from the apex of the leaf as if trying to reach their mark. I thought at first that they would surely allow themselves to drop, but, though many of them hung down by the mere tips of their legs, yet they would not risk a fall. They had at their disposal a more efficient method. One of them hung down to its full extent, clinging to the leaf with its hind claws. A second then climbed down along its body and thus almost doubled the length. Then a third and a fourth came down, and in this way the living line was elongated until it ultimately reached the ground. The ants had established a living ladder between the ground and the apex of the leaf. At this stage it was fragile and would not bear much strain, but other workers soon joined in it, linked themselves together, strengthened it round about on every side until it developed into a multiple chain. Nor must it be imagined that these ants were just thinking of themselves, that the second climbed down along the body of the first merely in order to reach the ground. This certainly was not the case. The workers that took part in the construction of the chain remained as permanent links. They never attempted to break from the machine or to escape themselves over the ground. They had linked themselves together so as to fashion a bridge which others in the community might use. These others availed themselves of the new construction. Those in the foliage soon discovered it, and a stream of workers was so quickly established that in ten minutes a hundred or more must have crossed it, and I lost nearly half the nest.

It would have pleased Lord Avebury to observe this incident. "In order to test their intelligence," he says, "it has always seemed to me that there was no better way than to ascertain some object which they would clearly desire, and then to interpose some obstacle which a little ingenuity would enable them to overcome." Is not this construction of the living bridge sufficient to satisfy Lord Avebury's demands? The ants desire to escape from their island. In order to do so they must surmount an obstacle; they must either cross over a sheet of water or descend through two inches of space. They select the latter as the easier feat, and the method they employ of surmounting the obstacle is the establishment of a living bridge.

Similar types of engineering workmanship are performed in their natural haunts. I have occasionally met with their construction in the trees. The chain as a rule is thrown vertically downward, but they will sometimes fashion a horizontal bridge so as to climb from leaf to leaf. Their chains may be as long as four or five inches. Some forty or fifty ants will then enter its construction, since they cannot merely link themselves in a single line, but must also mass themselves around the structure so as to give it the necessary strength.

That they are in the habit of thus bridging spaces in the foliage is made evident in another way. I removed a nest to a point lower down on the tree. Many of the workers soon deserted it and made their way up into the branches in order to get back to the original site. As soon as they reached the amputated stem their further progress was checked. It was amusing to watch their manner of behaviour, how they vainly attempted to construct a bridge in order to make a further advance. Many of the workers just stretched out from the stump. Another seized a comrade by the waist thrust it forward at full length, waved it in the air through the empty space, obviously in the hope of finding an attachment and thus laying the foundation of a living bridge. Of course in this instance the ants could not gain their ends for the nest had been completely cut away, but it showed how they instinctively build their bridges when they wish to cross the spaces in the leaves.

I observed another more delightful illustration of this kind. A stream of workers was moving through the foliage, passing and repassing in a double line which led from the collecting ground to the nest. At one place they had to negotiate a difficult situation; it was where the branches of two trees intermingled their foliage and caused irregular spaces in the vegetation through which the ants found it difficult to cross. At a certain point they encountered a serious obstacle. There was a wide gap between a leaf and a stem over which they were unable to pass. But a solitary worker had taken up a position and solely by the exertion of its individual efforts had managed to construct a bridge. With its jaws it had gripped the edge of the leaf; with its tarsi it had taken a hold on the stem, and the two were drawn close together by its exerting a continuous strain. In this way it fashioned an excellent bridge, partly by supplying its body as a road and partly by narrowing the gap.

Every minute hundreds of workers crossed and recrossed this simple bridge. They were all dependent on this solitary ant; if for a moment it relaxed its hold, then confusion would spread along their ranks. Nor did the single worker seek for assistance. Without aid, without relief, without a thought of relaxation, alone it had assumed this important duty and just clung with a rigid tenacity to its post. I have no idea how long it thus remained. I watched it in position for half an hour during which time many thousands of workers crossed it on their way from the leaf to the stem. It must have exerted itself to an extreme degree in order to continue so persistent a strain, yet it never for a moment made the slightest attempt to desert its self-established post.

I severed the bridge thus ingeniously formed, and restored the original gap. Consternation followed in the stream of workers, and a congested assemblage of helpless ants collected on the stem and leaf. But another worker soon came to the rescue and took the place of the one I had removed. It stretched itself across the gap in the same rigid way linking together the opposite sides, and thus replacing the original worker in the duty of constructing a bridge. Order and discipline then reappeared; the accumulation of workers soon dispersed and the even flow of labour was restored.

I know of no better example of individual co-operation in all the multifarious activities of ants. Here is a single worker lending itself to the advantage of the common weal. It is not merely an instinctive behaviour; it is an action employed in a special difficulty to meet a particular end. It indicates how the ants can divide their labour even to a refined degree. Moreover it displays a feeling of self-sacrifice, in that one will submit to tremendous effort in order to advance the well-being of all.

Here again we see the value of the attenuated structure so characteristic of this species of ant. Its elongated legs and extended body specially fit it for the construction of a bridge. Such must be the case in the simplest architecture and even more so in the manufacture of those complicated chains composed of a number of ants. We have already seen its value in the building of the nest, and it is also of use in the ejection of poison by permitting the ant to turn up its abdomen until the point is brought forward over the head. Thus the structure of the ant is eminently fitted for the duties of its daily life.

It would scarcely have been thought that these well-protected insects could have any very serious foes. They are able to attack in so fierce a manner and each is so well armed with a virulent poison that no ordinary enemy would dare to approach. And from the way they march in conspicuous files all over the branches of the trees it would seem as if they realized themselves that they had little danger to fear. I was, therefore, surprised to find in Mr. Mason's records that he had met with examples of the red ant in the stomachs of twenty-one species of birds. This is a powerful array of enemies. It includes the tit. babbler, drongo, shrike, oriole, myna, flycatcher, magpie-robin, ground-thrush, sparrow, lark, woodpecker, roller, bee-eater, hoopoe, hawk, cuckoo, coucal, partridge and waterhen. When confronted with so formidable a list as this, how can we say that the *Œcophylla* is immune ? Nevertheless it is only on the rarest occasions that we ever see them attacked by birds, and if they were really a tasty morsel they could never thus live exposed on the trees. We must remember that the red ant is easily identified, and, therefore, would seldom escape detection in the investigation of the debris from the stomach of a bird. I also calculate from Mr. Mason's records that, if the year be divided in half, more than three times as many ants were taken in the winter than during the summer months. This suggests that birds will have recourse to such food only when insects are scarce. The Golden-backed Woodpecker is their essential enemy and this might naturally have been expected for the bird lives largely on all kinds of ants. But few would have imagined that the Black Partridge ranked second in the number of their foes.

I have only casually referred to the state of the formicary at different seasons of the year. The community is active during winter and summer ; unlike many ants there is no period of complete torpidity ; even in the coldest months their columns may be seen ascending and descending the trees. In the cold season, however, they are distinctly more sluggish ; the numbers that join in the streams are less, and there are fewer habitations to be found upon the trees. Yet even at this time the larvae exist ; all through the cold months some are retained, and this must be essential to a community which depends on the special machinery of the larvae for keeping their chambers in efficient repair.

In March and April, as the warmth increases, the strength of the colony at the same time expands. The ants can now be seen at their various industries, capturing their victims, tending their cattle, bending and uniting the leaves. The area of the community also enlarges ; it may send its columns across the soil to invade the neighbouring trees. The larvae in the nests are increasing in number, the cattle are becoming more abundant on the foliage, and the time has arrived for architectural work. In some places byres are under construction, in others they are being stocked with food, and the complicated machinery of architecture and provision is working at the highest pitch. Columns of ants are advancing along the branches ; some are transporting the machinery for spinning, others are carrying cattle to the shed, others which support no obvious burden have their bellies distended with juice. It is a busy and energetic stream of workers that toils through these oppressive days.

This industry persists into the rainy season. It lasts until the sexual forms are reared and have abandoned the parent nest. Then the activity begins to decline. By August the armies have diminished in numbers. Here and there the files continue, but the multitude which overspread the foliage in June, has to a large extent melted away. Withered nests and deserted byres are now scattered about through the body of the tree ; most of them are empty, having done their work, and the fresh leafy habitation, teeming with life, is now less commonly seen. The great business of the year has been satisfactorily performed. The broods have been reared, the queens despatched ; hence the vigour of the commune now diminishes and the numerous chambers are no longer required. Sufficient workers will remain for the toil of winter. The community, though dwindled, will be kept intact for its reinvigoration in the succeeding year.

The sexual forms are not likely to be met with before the beginning of May. They are very different in appearance from the ordinary ants. The queen is immensely larger than the worker and is provided with extensive wings. Her usual colour is a vivid green which gives her a beautiful and striking appearance. It is from her that the species receives the name of the smaragdine or emerald ant. But the queens in this mango-grove were less handsomely adorned. They belonged to a variety with a yellowish dress. Some of them showed a faint tinge of green, but in the majority the colour was similar, though paler, to that of the worker ants. It would be tedious to describe minutely the queen. I will draw attention merely to her massive size, to her stout and bulky quadrangular thorax, to her long satiny transparent wings elegantly patterned with veins. The male in his structure resembles the queen, and is furnished with the same type of wings. He is, however, distinctly darker in colour, being almost a uniform brown. He is also clothed in a garment of hairs of which the queen shows only the slightest trace, and in bulk he is, of course, considerably smaller, being less than that of a worker ant. These are the sexual members of the commune. There will be a number of each in every nest. The male is but an agent for the production of fertilization ; the queen has within her the potential essence for the generation of a new swarm.

Most nests, if examined at the suitable season, will illustrate the mode of development of the queen. First, we will observe the royal larvae, stout, cylindrical, fleshy masses, slightly curved, with blunt extremities, and encircled with successive rings. They are enormous when compared with the worker larvae, appearing at least twenty times the size. Second, we will note the naked pupae, those in the early stages perfectly white, with all the parts well formed and distinct, the head bowed, the antennæ laid close along the middle of the chest, the legs bent neatly along the sides of the body, and the insect perfectly motionless and inert as though wrapped in a profound sleep. At a later stage we observe that the organs of vision appear as distinct points ; the ocelli from a triangle of brown spots upon the vertex, and the eyes develop into oval discs on either side of the head. Still later we note that the body darkens so as to assume a pale yellow tint. A few fleeting signs of life appear ; the quivering of the antennæ and the trembling of the limbs shows that the royal insect is waking from her sleep. Then the final stages follow. The wings, hitherto folded against the sides, are now drawn out of their delicate sheaths. They are trailed behind like gauzy streamers, limp and helpless without any strength, not yet being hardened by the roughness of exposure and still white with the tenderness of youth. This, however, is the final stage. It marks the awakening of the queen. She now moves feebly through the chambers of the nest. Her body expands, her limbs become more firm, vigour and rigidity come to her wings, her colour darkens to a yellowish red, black lines appear along the nervures of her wings and she develops her full muscular strength.

The larvae are fed by the worker ants during the period of their development in the nest. Indeed there is a special caste of workers associated with this business. They are distinctly smaller than the ordinary type ; they do not engage in the general duties ; they capture no insects, transport no loads, and are rarely seen in the streams of workers that journey everywhere along the branches of the trees. These diminutive workers are few in number. Their attention is given to the duties of the nursery, where they specially look to the welfare of the young. They act as nurses to the developing larvae, shifting them about from chamber to chamber, imbibing the fluid excreted by the cattle and ejecting it into the nurseling's mouths. It is not that they alone tend the larvae ; the ordinary workers too associate in the task. Also the smaller ones will enter into battle. Interfere with the habitation and they will join in its defence fighting with their diminutive jaws.

A remarkable peculiarity in the development of this ant is the fact that the larvae remain permanently naked ; they never construct a silken case in which to rest during their pupal sleep. I have already described the appearance of these larvae when telling of their use in the architecture of the nest. At this period, however, they look almost structureless ; later the external appendages develop and they become naked miniatures of the adult workers, perfect in all their parts. Each is pearly white in colour with the faintest yellowish tinge. There is a delicate translucency about its structure ; we seem to see into the substance of the tender tissues, and cannot but admire its simple elegance and its exquisite form and shape. It lies helplessly against the wall of the nest or hangs passive in its nurse's jaws. All its appendages are pressed close against its trunk so as to turn it into a fitting load. Its head is bowed and thrust in beneath its chest; its antennæ lie close along its ventral surface, and its slender legs, in parallel rows, are acutely bent and pressed tight along its sides. Thus it lies with no attempt at motion; to all appearances it is a dead thing. Yet this is but a passing phase; it is the wonderful trance of insect youth which will one day waken into life.

But its nakedness is the point of interest here. All its delicacy of structure is completely exposed; there is not a trace of an enclosing sheath. This is a most unusual occurrence amongst ants. The rule is for the larva to fashion a cocoon, a brownish bag of fine-spun silk which it wraps loosely about its body so as to invest itself on every side. Within this sac its development continues; there it changes from a structureless larva into the perfect form of the ant. All the steps in the metamorphosis are concealed owing to the enclosing sheath of silk. But it is otherwise in the case of the *Œcophylla.* Here all is naked and exposed to view; we can follow the wonderful unfolding process unobscured by a concealing veil.

It is natural to ask why the larvae of these ants do not sheath themselves in a pupal case. It is not through deficiency in the power of manufacture, for these larvae, as we have seen, are expert weavers, capable of constructing the silken fabric that enters into the walls and partitions of the nest. It might be thought that, since they expended so much in architecture, they had no more available for the construction of cocoons. But this can scarcely be a sufficient explanation, for there is a byre-building ant, the *Polyrhachis simplex,* of which the larvae both fashion their silk into cases and also weave it into the architecture of their nests.

I suspect that the explanation of the nakedness of the pupae is to be found in the nature of their arboreal life. The purpose, I take it, of a pupal case is to serve as a protection to the developing young. It is a loose impermeable sheath of silk which must shield the inmate from physical injuries, perhaps help to maintain a uniform temperature, and more especially protect it from damp. Ants seem particularly susceptible to moisture; if the nest of the *Œcophylla* becomes too dry, then the ants will transfer their larvae elsewhere; if the rain should permeate the tunnels of the *Polyrhachis,* then they will migrate to some drier abode. Now the nests which the red ants establish in the branches are infinitely less exposed to the effects of moisture than those which other species construct in the ground. The floods soon percolate into the soil, and the moisture, oozing through its porous substance, invades the galleries of an underground nest. In places it brings destruction to thousands of formicaries; it often compels incessant migrations; it forces a species, such as the *Polyrhachis,* to desert the dwelling dug in the soil and build a new one in the branches of the trees. But apart altogether from these serious inundations, the underground nest will be often in jeopardy. There must always be danger from occasional rainfalls; at some seasons the walls of the tunnels will be moist, at another crumbling and dry. Hence the larvae must be shielded from such variations; they must be swathed in an impermeable sheath if they are kept in an underground nest.

It is otherwise with the formicaries established in the foliage. The leaves, by their structure, are impermeable to moisture; the connecting fabric is of waterproof material, at least sufficient to keep out the rain. The only possible place where moisture can enter is through the narrow gateway of the nest. The larvae live in an impermeable chamber, and are consequently far better protected than if surrounded by the porous earth. They have, therefore, no need for individual encasements, and have abandoned the usual habit of sheltering themselves in the interior of cocoons.

We naturally seek for confirmation of this view. The *Polyrhachis* is the other important byre-builder, and we, therefore, expect to find naked larvae housed in its arboreal nests. But the larvae of the *Polyrhachis* are well sheathed in silk; each is completely hidden from view in a loosely crumpled bag. However, we must remember that for most of the year the *Polyrhachis* lives in an underground nest. It evacuates the soil only under stress of moisture, being but a temporary inhabitant of the trees. Moreover, its arboreal nest is not impermeable. It easily becomes waterlogged in heavy rain. The walls are composed of porous materials, particles of leaves, fragments of stems, often the soft seeds of grass. These result in a somewhat spongy collection which easily absorbs the rain. Thus the *Polyrhachis,* though it makes temporary arboreal habitations, has not lost the necessity of a pupal case. Its larvae are still subject to the effects of moisture, and thus differ from those of the red ants which live permanently in watertight nests.

Though the larvae of the red ants have lost the power of constructing individual cocoons, yet their silk-producing instinct has in no degree diminished; it is only applied to another use. It, no doubt, first originated for the ordinary purpose, each larvae using its own supply for the manufacture of a personal sheath. Later it was directed to more altruistic ends. The silk-producing machinery was not used for themselves; it was introduced as a part of the general architecture, and thus applied to the well-being of the whole nest.

The last point for consideration is of some practical interest. These ants have a certain economic value. Their columns, which so perpetually search the foliage, must in some way affect the existence of the tree. Arboreal mammals will be driven from the branches, birds will be prevented from nesting in the leaves. Insects of all kinds will be captured and destroyed; those special forms which serve the purpose of cattle, will, on the other hand, be carefully preserved. Some insects advantageous to the life of the tree, such as those of use for cross fertilization, may be prevented from fulfilling such ends. It is more likely, however, that injurious kinds are kept away by the swarms of ants. Leaf-eating insects and caterpillars and those which tunnel in the wood are sure to be captured when they invade the tree; coccids and membracids, which drain the sap from the shoots, are carried off and collected elsewhere. We know little of the complex chain in which so many lives are interlinked, but on the whole it would seem that the presence of the ants makes for the general advantage of the tree. It may be that both the ants and the tree are equally in each others debt, that the ants defend the tree from enemies and the tree supplies the ants with shelter and food.

Mr. Dutt has discussed this question in the agricultural memoirs, and he tells us there some interesting facts with regard to the relation of this ant to man. In Eastern Bengal and Assam the red ants are a pest. The mango-pickers cannot climb to collect their fruit and have to break it down with poles. But more extraordinary is the fact that people eat these ants. The Murries of Bastar in the Central Provinces are said to use them as a regular food. They collect the nests, shake out the contents, beat up the insects into a pulpy mass and then enclose them in a packet of leaves. Each of these packets, about the size of a goose-egg, is sold for one pice. The squashed ants are then prepared for food. They are mixed with salt, turmeric and chillies, again ground down with stones, and then eaten raw or with boiled rice. These facts are quoted by Mr. Dutt from a communication by Mr. Long. The eater is said to derive resistance against fatigue and endurance in the sun's heat. We may possibly doubt these supposed advantages, but, when we consider the amount of formic acid in these ants, we will certainly allow good gastric functions to those who can tolerate such corrosive food.

This concludes what I have to say on the subject of the red ants. If I have not wearied my readers with the long description, it will be due to the intrinsic interest of the subject, to the multifarious activities of the busy commune and the wonderful instincts by which the ants are guided in the fulfilment of their essential ends. "Order is Heaven's first law." Such indeed do we see exemplified as we watch this ebb and flow of life. We have observed the order in relation to the seasons, the steady growth in activity and numbers, and then the subsequent decline. Each stream shows order in its methodical progress as it flows from branch to branch. Each load that is carried has a place in the operations; it is a capture on its way to be drained of fluid, a *Lecanium* about to be lodged in the enclosure, a larvae brought along for the important business of securing the walls of a shed. Every bend in the stream is an ordered action, controlled by that wonderful directive sense through all the turns and complexities of the march. What order do we not see in the nest-construction, how all combine in a harmonious union, how the leaves are drawn together with a uniform tension, how in one place a worker will strain as an individual, in another place two or more will link themselves together, how all will maintain the leaves in position until the larvae have completed their remarkable work. We see order and system in the taking of the prey, in the tenacity of the first worker that makes the capture, in the speed with which the reinforcements come to the rescue, and above all in the stubborn unyielding stretch. So also we observe it in their efficient transportation, and in their regular manner of securing cattle and of herding them within the sheds. How marvellously methodical is their system of bridges, either where one ant resigns itself to the general good, or where fifty workers link themselves together so as to construct a living rope. There is order in their repeated periods of rest. Though at first sight they seem engaged in ceaseless toil, yet on close examination we locate the rest-camps in which each ant takes its temporary rest. Even the defensive army, though it may appear like chaos, is governed by an ordered plan. It comes forth on the summons of the outside sentries, impetuously and ferociously engages the enemy, each ant prepared to render up its life in order to achieve the safety of the nest. There is no confusion in a colony of ants. Order and system is the guiding law. Each member of the commune has its allotted place and its duty in the daily toil.

THE COMMON BUTTERFLIES OF THE PLAINS OF INDIA (INCLUDING THOSE MET WITH IN THE HILL STATIONS OF THE BOMBAY PRESIDENCY).

BY

T. R. BELL, C.I.E., I.F.S. (Retd.)

(*Continued from page* 717 *of this Volume.*)

PART XXXI.

Family—HESPERIIDÆ—*continued.*

Genus 7.—SARANGESA.

This genus is characterised as under in the *Lepidoptera Indica* Vol. X, p. 88 :—

Antennæ.—Very slender, about two-thirds lengths of costa of fore wing ; club moderate, slightly recurved.

Palpi.—Porrect, third joint short, bluntly conical.

Hind tibiæ.—With two pairs of spurs. In the male with tuft of hairs attached to proximal end.

Fore wing.—Vein 12 ends on costa a little before end of the cell ; discocellulars suberect, the lower the longer ; vein 3 from close below lower end of cell, 2 from about one-third from base ; median vein slightly curved up between bases of 2 and 3. Cell less than two-thirds length of costa; costa gently arched with outer margin convex, shorter than the hinder margin as a rule (in *dan* it is equal to it) ; hinder margin straight.

Hind wing.—Discocellulars very faint, apparently in one quite straight line, of about equal length ; vein 3 from very close to lower end of cell, 2 from a little beyond the middle; costa slightly arched, apex rounded, outer margin somewhat sinuous ; wing about as broad as long.

Egg.—Dome-shaped, the height about two-thirds the breadth, very slightly constricted at the base, the top very slightly depressed ; green or yellowish in colour ; shining, the surface sculptured by 14 or 15 meridional ribs that are somewhat coarse, minutely beaded.

Larva.—Spindle-shaped, fattest in the middle, somewhat narrowed in the anal end, broader in the fore end where the neck is narrow compared to the somewhat bullet-shaped, bilobed, dark-brown head with a rugose surface. The surface of the larva covered with tiny feathered hairs only visible under a lens. The colour olive-green of a darkish shade, sometimes brownish with always a white collar consisting of nearly the whole of segment 2.

Pupa.—Not very stout, fattest in middle, pointed at anal end, rather broad and square in front, the frons convex but not actually beaked ; with a triangular cremaster, prominent spiracular expansions to segment 2 and the proboscis produced free beyond the ends of wings. The colour green or yellowish brown with a greyish " bloom " caused by a copious clothing of minute, erect hairs all over the body.

Habits.—The eggs are laid on the top or underside of a leaf, on a leaf-bud or stalk. The larva makes a cell by turning over a small portion from the edge on to the top, the shape of this " lid " being triangular ; it is fixed lightly down and coated on the inside or underside with a carpet of white silks upon which the larva lies with its back towards the main leaf-surface, its head turned round on its side. Later on it continues this mode of living but, often, makes a cell out of a hanging or caught up withered leaf with no particular shape. The pupation takes place in such a cell as a very general rule. The pupa is attached by the tail strongly. The butterfly flies near the earth, is active, quick, resting on the upper surface of leaves, close to the ground; flies strongly but not for any length of time at a flight, returning to the same perch again and again; basks with the wings horizontally outspread in the sun, sometimes even on the bare ground or on a stone and generally rests in that position, although at night it sits on the underside of leaves but always keeping the wings spread. The larva feed upon dicotyledonous plants of the families *Acanthaceæ* and *Amarantaceæ*.

207. Sarangesa dan, (*Fabricius*).—Male. *Upperside.*—Rufous-brown. Fore wing, with three small, semihyaline, subapical dots from near costa in interspaces 6, 7, 8, the middle one the smallest and most innermost; in some specimens one or both the lower absent; a large semihyaline spot in end of cell, its inner side straight, its outer side deeply excavated and sometimes this excavation dividing it into two, of which then the upper is only half the length of the lower which is elongated; a small spot between this cell-spot and costa; a small square or round spot near base of interspace 3; a much larger one inside this last in interspace 2 touching it with its outer, upper side; and a minute spot, sometimes two below them in interspace 1, one above the other; all these spots slightly tinged with ochreous, brilliantly golden-ochreous in one incidence of light, all varying much in size in different examples; some brownish, indistinct marks on the wing decipherable as a subbasal transverse band, a post discal band highly excurved towards apex with the subapical dots on its upper part and a submarginal band; base of wing with ochreous hairs; the inner margin with a short fringe of similar hairs. Hind wing with a basal, indistinct brown transverse band; a subbasal similar band including a spot in cell; a medial curved similar one con-joining the subbasal at costa and a very slight marginal brown one. Cilia of both wings brown, those of the hind wing chequered faintly in some specimens; the fore wing with a light area just above tornus. *Underside.*—Like the upperside but duller; both wings with the markings of the upperside. The hind wing has a clothing of long, ochreous hairs from base outwards, reaching the outer margin on hinder half of wing and the abdominal margin has a fringe of shorter ones. *Female.*—Similar to male but with the hyaline spots, on the whole, always smaller, and always silvery-looking. Antennæ with the shaft brown, ochreous above, clearer ochreous below the club; club black, the upperside greyish; palpi light-ochreous above and below as well as the head and the underside of body; the legs have the tarsi with pinkish tinge. The tuft on hind legs of male is more orange.

Larva.—The larva is in shape a fat one, fining towards both ends which are comparatively narrow; the anal flap is semielliptical, slightly longer than a semicircle, sloping at an angle of 30°; segment 13 a little broader rather than one-third its length in the middle, for this 13th segment is curved convexly backwards, being thus broadest in the dorsal line; segment 12 broader again than this latter and only a little more than twice the length in dorsal line; segment 11 twice the length of segment 12 and again slightly broader than it. The body comes to a distinct neck at front margin of segment 2 and the head is, as usual with skippers, a large one compared to this neck; the legs are all well tucked under the body; the whole larva generally sits humped up in the middle with its head turned round on its side. The *head* is perfectly heart-shaped, the dorsal line being considerably depressed below the rounded lobe-summits though not broadly, less depressed of course down the face; the clypeus is triangular and not small, also depressed ; the surface is very rugose in irregular raised longitudinal broken, uneven lines and is clothed with silky appressed hairs though not very densely ; the surface is shining ; the labrum and ligula are, like the whole head, dark chocolate or brown, the eyes, jaws and antennal second joint the same, the basal joint also. The *spiracles* are very broadly oval, nearly round, whitish in colour, small, those of segments 11,12 slightly larger, that of segment 2 the largest. The *surface* of the body is covered all over with minute, short hairs to the extent of about 4 or 5 to the linear millimetre, each with a thickened, rounded top, those round the margin of the anal flap being comparatively long ; each hair rising from a little white dot : they are white themselves, these hairs ; there is a longer, simple hair sticking out backwards from the edge of the anal flap-margin in the lateral region on each side ; the prolegs, claspers and true legs have also longer, simple hairs on them. The *colour* of the larva is, when full grown, olive-green with an indigo-coloured, narrow, dorsal, pulsating line or band ; the front half of segment 2 whitish and shining. In the earlier stages the tint is much browner, approaching in some cases rusty, the white colour very conspicuous then. L : 20 mm. ; B : 4·5 mm. at middle ; half that at segment 13. There is an indistinct lateral and spiracular white line, very thin and inconspicuous.

Pupa.—The chrysalis is light green, slightly covered with a white "bloom," covered with fine, more or less erect, fairly densely arranged hairs with shortly curved points except on wings ; stout, with a humped thorax and spiracles of segment 2 with a semicircular, prominent small, furred, chocolate-coloured expansion behind each. It is of the ordinary *shape,* that is of transverse circular section, slightly constricted somewhat shallowly and broadly laterally at middle, more conspicuously dorsally because of the humped thorax ; the cremaster has a very short and transverse base, the suspensory portion oblong, somewhat bend down, the suspensory hooklets arranged along truncated extremity, the whole member rather stout, the edges or margins thickened leaving the dorsal line broadly depressed, ventral extensor ridges slight and produced forwards, at first diverging, then curving round towards each other but not meeting ; segment 13 transverse, half the length of the whole cremastral segment; 12 somewhat longer than 13, though not much ; 11 than 12. *Head* rather small, bowed, the frons prominently convex between the prominent eyes, in a plane perpendicular to the longitudinal axis of pupa ; the vertex nearly square between the bases of antennæ, in a plane at an angle of 30° to that axis ; the eyes bulging, longer than broad with a depressed, broad, shining, smooth band across middle perpendicular to the length of eye. Segment 2 about the same length as head-vertex and, like it, somewhat convex dorsally (in sense of length) ; thorax at first ascending from segment 2 in the same plane, then curving broadly up to apex and down again to hinder margin, the apical point being about two-third its whole length from front margin ; its hinder margin elliptically curved towards segment 4, meeting the wing-margins in a very broadly-curved, open angle of about 90° ; segment 4, therefore, long laterally, half the length in dorsal line ; abdominal dorsal line straight thence to segment 12 ; ventral line slightly convex in extreme half of wings then gently curved to cremaster ; the proboscis produced free beyond ends of wings to hinder margin of segment 9, the pupal surface somewhat depressed to receive it. *Spiracles* of segment 2 indicated by a linear, short, brown line on common margin of segments 2 and 3, with a semicircular (slightly higher however than broad) lappet or expansion behind it and immediately contiguous to it and perpendicular to the pupal surface, thickest at base, facing forwards, the surface of this little body being silky-plush-like and deep chocolate in colour ; the other spiracles of ordinary size, broadly oval, slightly raised, brown. The *surface* of pupa is shining, though not excessively so, the wings have the veins thinly(gradually) raised, the whole surface with the exception of these wings and a fairly broad hinder (bevilled) margin to segments 8-10 and front margin to segments 9-11 covered with the fine, erect straight hairs with little curved tips mentioned above, like a sort of down, that on dorsum being perhaps slightly inclined backwards, that on head, eyes (with the exception of the band across them which is smooth) being longer than rest slightly, each hair-proceeding from a tiny brown spot. *Colour* green with a white "bloom" dotted with brown. L: 16 mm.; B: slightly over 4mm. at middle.

Habits.—The young larva cuts a piece out of the centre of a leaf, either young or mature, turns it over on to the top—it is often triangular in shape—and fixes it down with silks all round, leaving an opening for emergence and entrance; it coats this piece with silk and lives upside-down on the piece; lying always humped and contracted with its head turned round on its side it is always sluggish. Afterwards, in the second stage, it turns over a larger piece; after that it lives in folded leaves which wither, and it attaches them to the plant to prevent them falling to the ground. It pupates in such leaves which it does not cover with silk inside to any extent. The pupa is attached strongly by the tail and by a rather loose body-band which in its turn is fastened by the middle by a silk to the top of the cell, the body band being fastened to the sides, one on each side of the pupa. The pupa moves lazily from side to side when disturbed, the motion being from the segment margins, or in the intersegmental membranes of segments 8, 9; 9, 10 and 10, 11. A lot of larvæ were obtained in the Chandwadi evergreen, in North Kanara and round it at Christmas, in the Supa Petha, at 1,500′ elevation. The butterfly is not uncommon in the District above Ghats and frequents the big jungles where there is a heavy monsoon rainfall and where the ground-vegetation practically never dries up. It keeps altogether to the underwood where it may be seen on leaves close to the ground, its wings outstretched horizontally, basking in the sun-patches that come through the overhead leaf-canopy. It rests generally on the undersides of leaves and is not commonly to be seen although the larvæ are plentiful enough. The flight is very similar to that of the insects *Sarangesa dasahara* and *purendra;* the larva is also extremely like those of that genus. All the specimens of the imago that occur in Kanara District in Bombay are golden-brown in colour and much brighter than those figured by Colonel Swinhoe in *Lepidoptera Indica*, vol. x, pl. 773, figs 2 to 2d; the male, also, invariably has the larger hyaline spots on the fore wing. The foodplant of the larva is *amarantaceus* (of the family *Amarantaceæ*) and is known by the natives as Agadha. Its scientific name is *Achyranthes aspera* and it may be known by its very elongated spikes of small, sessile, hooked fruits that stick to the clothes as one walks through it—it is often gregarious; the flowers are very small and inconspicuous, the leaves rather large and obovate with soft pubescence. Colonel Swinhoe, in his book says "Habitat: Southern India, Burma, Siam, Malay Peninsula. Distribution; the type came from Tranquebar in S. India; we took it at Mahableshwar and in several parts of the Bombay District and we have it from Coorg, Ootacamund in the Nilgiris, Rangoon, the Meplay Valley and Siam; Distant records it from Perak, Manders from the Shan States, Elwes from the Karen Hills, Moulmein and Tenasserim, Watson from the Chin Hills, Moore from Mergui, Wood-Mason and de Nicéville from Cachar, Davidson, Bell and Aitken from Kanara, Evans from the Palni Hills and Fergusson from Travancore. We give figures of the two extreme forms; they may be seasonal but we have no evidence to prove it. Unfortunately Davidson, Bell and Aitken did not figure the larva and pupa." This omission has been remedied long ago but the figures have not been published; they are still waiting.

208. Sarangesa purendra, (*Moore*).—Pl. N. figs. 83 ♂, 83a ♀.—Male. *Upperside* dark vinaceous blackish-brown. Fore wing with three subapical dots of equal size in a curve from near costa, a bar across the cell near its end, its outer side deeply excavated; a small spot between it and costa; another immediately outside its lower end with a short linear spot below it; all whitish and semihyaline. Hind wing with a spot at end of cell with a discal and marginal band all very little darker than the ground colour and very indistinct. Cilia of both wings brown alternated with grey, touched with a little whitish above the tornal angle of fore wing. *Underside*: —Paler than the upperside with the markings similar; an additional, whitish, indistinct spot on the fore wing towards the base of the internomedial interspace. Antennæ black with white dots on the shaft and a whitish streak on the underside below the club; palpi, head and body above blackish-brown; on the underside the palpi are grey; pectus and legs with grey hairs.—Female. *Upperside.*—Similar to the male, the semihyaline spots on the fore wing a little larger. *Underside*:—paler than in the male. Forewing with the whitish spots larger. Hind wing with a whitish spot at end of cell, a discal series of whitish, lunular spots and a few more indistinct whitish spots inside the wing. Expanse: 32mm. to 35mm. (Swinhoe, *Lepidoptera Indica,* vol. X, p. 89.)

It is probable that all the specimens from which Colonel Swinhoe described the species were caught insects and that none of them were bred. The following description is from a series of fifty bred specimens from Kanara:—

Male. Fore wing. *Upperside* with white, short, decumbent hairs sparsely disposed from base to middle of wing, stopping before the discal markings; the outer half beyond discal markings similarly clothed, sometimes more densely but always leaving a broad terminal border more or less without them; this white hair-scaling giving a distinct greyish look to the portions having it; the usual short fringe of brown-black hair along inner margin. Cilia brown broadly at ends of veins, leaving the intervals narrowly white sullied with brown; the cilia at apex and above tornal angle rather prominently white. There are the three semihyaline, subapical spots mentioned in Swinhoe's description above; the bar at end of cell which is, however, not excavated on the outside, sometimes shallowly and widely; the spot above the bar on costa; a spot below the bar in interspace 2 outside end of bar, about as broad as that bar and filling the whole breadth of interspace; a small spot outside the upper, outside corner of this last in interspace 3; besides: a small spot or dot, joined to the inside lower corner of the spot in interspace 2, in the upper part of interspace 1 with another dot inside and under in the lower part of the same interspace 1; often, also, finally, another similar spot or dot inwards half way towards base of wing from this last and in the same interspace 1. All these spots and dots are shaded with black, discal markings on their inside borders, the subbasal spot (the last mentioned) on its outside edge, the subapical also on the outside. Beyond the grey hair-scaling the outer part of the wing is, as said above, broadly dark-blackish with pale dots showing through by transparency so to speak from the underside in a submarginal series in interspaces 1 (two in this) to 8 and even 9 (the 9 spot then above the top preapical series of three semihyaline white spots), those in interspace 1 quite marginal as also those in 2 and 3; those in 4 and 5 a little in from margin, those in 6, 7, 8 still further in; parallel to this submarginal series there is a faint postdiscal series of four of which two are in interspace 1 and one each in 2 and 3. All these submarginal and post discal spots are very faint but the submarginal ones of interspace 1 are generally a little clearer than the others as are also those in interspaces 4, 5 while the post discal dots are always blurred. The basal third of the cilia is always brown. Hind wing clothed sparsely with much longer white hairs, those in the inside area longest, standing away from the surface; the fringe along abdominal margin-edge short and brown with white tips. The wing is of the same ground colour exactly as the fore wing and has a subbasal series of three blackish, rather large, very indistinct spots of which the central one is in the cell, the top one in interspace 7, the bottom one in 1; a postmedial series of similar dark spots but rather elongated and quite complete; all the white spots of underside showing through obscurely-pale except the one in the middle of cell which is more or less distinct but small. Cilia exactly as on fore wing except that the white intervals are more extensive, their bases brown. *Underside*:—Much paler than the upperside, the black borders to the spots showing darker against the ground colour and slightly extended-suffused. Forewing with the subapical three dots confluent, the cell-bar confluent with the spot above it; all the other semihyaline white spots similar to those of the upperside; the four white spots in interspaces 1 (two in this), 2 and 3 of the postdiscal series blurred-white or yellowish but distinct; those of the submarginal series on the whole better defined also, those in interspace 1 and 4, 5 quite distinct but very small, white, the upper occasionally yellowish as are the apical ones of the series—the dots in interspaces 2, 3 are nearly absent or very feebly expressed in all cases; there is a white streak from the origin of vein 2 inwards along the vein to base of wing often reduced to a spot at end (below origin of vein 2); the internomedian interspace is very pale brown throughout; the base of wing with a clothing of sparse, longish decumbent white hairs and a few white scales. Hind wing of the same shade as fore wing with similar white hairs at base and white scales in posterior part as far as anal angle; with the following white or yellowish-white spots: a subbasal or antemedial series of three, one in interspace 7 one in the upper part of cell and an obscure one in interspace 1; a postmedial series in a curve parallel to outer margin, quite complete, the first or uppermost in interspace 7, one in each of the interspaces 6, 5, 4, 3, 2 and a pair in 1; between these two series there is a thin white bar on the discocellulars with a streak-spot beyond in interspaces 4 and 5 with a slight blurred spot above them in 6 and a series of three more below in interspaces 2 and 1; so that there is really a sequence of three transverse bands of spots; antemedial, medial and postmedial; there is always an attempt at a fourth series, marginal, also, but it is nearly always limited to two in interspace 1 and one in interspace 2; the margin thinly darker. The "streak-spots" are elongated spots in interspaces 4, 5, and, curiously enough, on the underside of the fore wing, the same interspaces are often whitish postmedially resembling two streaks corresponding to those on the hind wing. Antennæ the same colour as wings, ringed with white all up the shaft, the club black with the ventral side of its base extending a short way down shaft ochreous-whitish head, palpi, body concolorous with wings above; below the palpi, pectus or breast and abdomen are white. The long fringe—it is hardly a tuft—on the tibia of the hind legs is light-ochreous in colour.—Female. Very like the male in colour but darker on the upperside, with a slight russet tinge on the underside. Markings identical; also antennæ, &c. Expanse: 30 mm.

Egg.—Dome-shaped, broadest just above the base, slightly flattened on top round the micropyle. Surface divided into sections by fifteen longitudinal ribs of 0.05 mm width and 0.03 in height, rounded, rough; none of these ridges reach further than the edge of the concave area surrounding the micropyle which is only very slightly depressed and is 0.1 mm in diameter, circular; every alternate rib finished well short of the others; besides this the surface is shining, cross-rayed between the ribs with little, parallel, equally-spaced lines which are 0.05 mm. apart and about 0·0125 mm. in width, very low; all these ribs and cross-rays become more or less obsolescent towards the base of the egg; the distance between the ribs at the broadest part is 0.1 mm and between the cross-rays of two adjacent ribs 0.175 mm. Colour is light-green when laid, turning red before the larva emerges; the ribs are all white, the cross-rays green like the ground-colour. B: 0.7 5mm; H: 0.5 mm.

Larva.—The *shape* of the larva is that of a spindle, the transverse section of segments 2 to 12 is circular, the body is much fattest in the middle, the ventrum is, however, somewhat flattened, the ventral surface separated from the dorsal half-segments by a slight ridge or fold immediately below the spiracular line; the anal segment is rather long, in shape a parabola, the end rounded; segment 13 well-developed; segment 2 is rosey-whitish, shining, the front margin straight, as long as segment 3 but narrower; there is a distinct neck and the *head* is comparatively very large, round in shape with a distinct though narrow, shallow sinus on the vertex in dorsal line dividing it into two, well-defined broadly rounded (on the vertex of each) lobes, the surface shining, rugose and covered with minute, decumbent, fan-shaped bunches of short, translucent-white hairs, each fan being made up of five or six rays or hairs all pointing downwards; it is really broadly heart-shaped; the true clypeus is equilateral, triangular, the apex acute, the length about half the height of face, the sides slightly convex outwards; the false clypeus outside reaches three-quarters the height of the head, similarly triangular, a broad stripe rather difficult to make out; labrum transverse, shining red-brown, one-third the length of the true clypeus; ligula the same length as labrum, red-brown with a wide, frontal, triangular sinus or emargination set with a few stiff, short, rusty-red hairs on the edge; antennal basal joint blackish red-brown as also the second joint; mandibles dark red-brown broad, strong and with their cutting-edges obscurely toothed; the eyes are arranged numbers 1, 2 close together, 3 a little further apart, 4 still further away, 6 about as far from 4 as 4 is from 3, number 5 behind and somewhat nearer 6 than 4, forming a triangle with these two, numbers 1 to 6 in a slight curve convex forwards, all blackish; colour of head deep red-brown; the small fans are really cup-shaped bodies with thin, hair like rays from a small conical tubercle surmounted by a thin stem, about 0.05 mm in height or length, the fan 0.05mm. in diameter, the space between two ray-ends being about 0.15 mm. all translucent-white; *surface* of body is minutely pitted and covered with small, short, transparent-looking star-topped hairs as above described; the segments all well-marked and thin, parallel, impressed lines transversely across body in front of the hinder margin of each segment, 3 or 4 to each, the free margin of anal segment set with some 8 or 10 longish, simple hairs as well as having some longer-stemmed (than the rest of the body) star-topped ones; bases of prolegs and true legs also with fine, simple hairs. *Spiracles* oval, small but well defined slightly raised, yellow-brownish. *Colour* of body a dark, blackish olive-green with a dark, dorsal, pulsating line and a fine, rather faint, lateral longitudinal line; segment 2 rosey-whitish; ventrum a shade or two lighter. L: 21 mm.; B: 4.5 mm. at middle.

Pupa.—This is, in *shape,* like that of *Sarangesa dasahara*: eyes prominent, square in front and broad, the frons of the head slightly "bossed" with a small, round, hemispherical swelling; the breadth of the pupa at the eyes is broader than that at the shoulders or, at any rate, quite as broad; the lateral outline behind the shoulder parallel-sided as far as ends of wings with a slight dorsal constriction at segment 5 and a slighter, longer, lateral one between those points; *head* bowed, the frons prominent strongly between the eyes, in a plane perpendicular to the longitudinal axis of the body; vertex inclined at an angle of 30° to that axis with the dorsal ascents of segment 2 and the front of thorax, the hinder margin straight, the length rather greater than that of segment 2; this latter segment a transverse piece with straight hinder margin, as long as segment 4; the thorax broadly humped, the apex close to the hinder margin, the same height more or less from about one-quarter behind front margin to one-quarter before the hinder margin, the falling to the slight constrictions, the hinder margin a short parabolic curve meeting the wing in an open, well-rounded angle of something under 90°; segment 4 is one-fifth the length of thorax in the dorsal line; 5 slightly shorter; segment 6 quite twice as long as 4 (this segment has the hinder margin broadly curved backwards, that of segment 5 less curved); segment 6 has the hinder margin straight; the portions of segments 9, 10 not included in the bevilled margins are short, the bevilled margins are smooth; 11 behind the bevilled front margin is also short; 12 has the dorsal line inclined to the axis of pupa at an angle of about 30°; 13 inclined at 45°; segments 11, 12, 13 coequal in length but narrowing backwards of course; 14 is composed of an anterior, broad, triangular portion and a much narrower, oblong, equally long, terminal moiety. *Surface* covered with erect, fine, light hairs all over, the end-halves strongly curved but without branchings, about 0.2 mm. in length, some form minute, dark depressions or dots; the wings shining, the rest covered with a blue-glaucous "bloom"; proboscis free after ends of wings as far as segment 11, fore legs reaching one-third of length of wings towards their ends, mid legs about two-thirds, antennæ between the two; there are no signs of any inserted parts between the two halves of proboscis near base or between it and fore legs; the clypeus is small, diamond-shaped and longer than broad; the extensor ridges of cremaster ventrally meet forwards making a completely enclosed circular space round the scars of the claspers; the suspensory hooked shaftlets are bunched at extremity of cremaster and orange in colour, short; the segments are all well-marked and the wing-veins are obtusely prominent. *Spiracles* of segment 2 are very prominent semicircular processes, dark-brown and spongy-looking, facing forwards with a diameter quite as great as half the length of segment 2; the other spiracles are small, broadly oval, prominent, with central, depressed slits, soiled, dull orange in colour. The *colour* of the pupa is rather dark yellowish-brown with the bloom above mentioned; thorax and head darker. L: 14 mm.; B: somewhat over 4 mm.

Habits.—The eggs are laid singly anywhere on a leaf or leaf-stalk, the larva, emerging, immediately makes itself a house, turning over a triangular part of the leaf from the edge. It does not eat the shell of the egg and emerges through a hole towards the apex which it eats through from inside. Later on, as it grows larger it makes new cells which are always only lightly fixed down round the edges; in the last stage, when full-grown, it prefers making its home in the middle of two or three withered leaves which it binds together strongly with silks, often choosing a dead leaf and a couple of green ones; it pupates in this, fixing itself by the tail firmly and throwing a band round the body in the usual position; the inside of the cell or house is generally lined thinly with web or silks. This skipper has the same habits exactly as *Sarangesa dasahara* frequenting similar places and flying in a similar manner, resting in the same positions and generally occurring in similar numbers together with that species. Many specimens were bred in the Kanara District in Bombay on species of *Asystasia* (*Acanthaceae*) both in the dry weather as well as in the monsoon. It is found there from sea level up to 2,000′ in the Ghats.

This species is most similar to the *Sarangesa purendra* figured by Swinhoe in plate 778, figures 3, 3a and 3b in *Lepidoptera Indica*, volume X. Fresh specimens are, however, much blacker and the undersides of the hind wings are dotted with white more like his *S. sati* on the following plate. These butterflies (*Sarangesa dasahara* when fresh is just as black) fade very much with time and become earthen coloured. Swinhoe says *purendra* is a common species all over India ; " Moore records it from Bombay, Umballa, Kasaoli and Kangra; we took it at Bombay, Poona, Mhow, Karachi and Hyderabad, Sind; we have it also from Ranikhet, Dehra Dun, Pachmari and Karwar where Davidson, Bell and Aitken bred it ; de Rhé-Philipe records it from Masuri, Betham from Matheran, Hannyngton from Kumaon, Doherty from Kunawar. It does not appear to extend into Burma or Ceylon." (Swinhoe, *Lepidoptera indica,* vol. x, p. 90).

The male and female butterflies are represented on plate N, figures 83 and 83a respectively. While the female is a good colour in the picture, the male is far too red although it has, in nature, a slight tint of the red in the brown, as compared to the female, on the underside. The actual insects from which the paintings were made were certainly not Kanara specimens and came most probably from the neighbourhood of Bombay or north of that.

209. Sarangesa dasahara. (*Moore*).—Male. *Upperside.*—Coloured like *S. purendra,* a little darker. Fore wing with three similar subapical dots ; a small dot at the upper end of the cell with another above it ; a very indistinct, discal band and a similar middle band both slightly darker than the ground colour. Hind wing with indications of a discal and marginal band. *Underside* :- Much paler, the bands consequently more pronounced, the hind wing with some grey suffusion between the band and along the abdominal area, caused by minute, greyish-white scaling. Cilia as in *S. purendra.*—Female. Similar to the male but, in the fore wing, there is an additional dot below the cell, all three being in a line and a dot in the interspace 3 a little before its middle. *Underside* :—Similarly marked, the coloration and bands as in the male. Expanse up to 35mm.

The above is Swinhoe's descripti n. In *Lepidoptera Indica,* Vol. X, p. 90, he says that the types came from Bengal and that the species seems to be common all over India but, apparently, by his enumeration of localities from which he has seen specimens, he has not had it from anywhere in Peninsular India except Ganjam on the east coast and Travancore south of Bombay Presidency on the west coast. His above description is meagre and, judging by bred specimens of which we have half a hundred available, based upon inadequate numbers. He has erected a species, the one following *S. dasahara* in the book, which he has named *S. davidsoni* from Mahableshwar and Karwar (this latter in Kanara) and gives descriptions of the larva, pupa and habits from "Davidson, Bell and Aitken in the Journal of the Bombay Natural History Society, Vol. XI, 1897, p. 34." Davidson, Bell and Aitken called it *S. dasahara* and it is difficult to say how the mistake arose, for mistake there certainly is. The insect that occurs in Kanara is certainly not *S. davidsoni*, Swinh. A description of it is as follows, taken from the fifty specimens ; if it is not *S. dasahara*, then it must be a new species and *dasahara* does not exist in the District of Kanara.

Male. Fore wing. *Upperside*-Vinaceous—blackish-brown, certainly darker than in *S. purendra* because there are no grey hair-scales on either wing ; they are replaced by much fewer yellow hair-scales on the fore wing and by brown hairs on the hind wing. Fore wing with the three subapical, semihyaline spots, two spots towards end of cell, the upper triangular, and sometimes joined to the lower by its lower angle, the two then forming one spot deeply excavated on the outer side ; a somewhat smaller spot between these and the costa ; a white, semihyaline dot towards the base of interspace 3 half way between the cell-spots and the subapical spots, on a level with the lower of the former ; another in the middle of interspace 2 about half way between the cell spot and the one in 3 ; a transverse medial (or very nearly) band from inside the cell-spots to inner margin appearing somewhat macular and a similar transverse, postmedial band somewhat oblique, beginning rather broad inside the subapical spots, including the dots in interspaces 2 and 3, to inner margin before tornal angle, the inner margin in continuation and a marginal band up again to apex in further continuation, all darker than the ground colour ; the interval between the postmedial and marginal bands often lighter than the ground colour because of ochreous scales ; a fringe of short, dark hairs along inner margin. Hind wing with the following dark transverse bands: an antemedial, much excurved one, consisting of a large spot in interspace 7, another at end of cell and filling it, a third in median interspace by abdominal fold ; a postmedial series of spots beginning with one in interspace 7 below middle of costa, excurved in the middle of wing, with a spot in each interspace 6, 5, 4, 3, 2 and two spots in interspace 1, the band practically continuous and somewhat irregular—that is not always exactly symmetrical in two specimens ; the abdominal margin fringed on its edge with white hairs. *Underside* : Paler on the fore wing with some ochreous hairs at base, the semihyaline, white spots as on upperside, the dark, transverse bands rather more obscure ; with a pale streak from origin of vein 2 inwards under the vein to base. On the hind wing much paler ochreous-greyish because of a plentiful sprinkling of hairs and scales, omitting always the dark bands which, therefore, stand out much more boldly than on upperside ; the costa narrowly with apex broadly dark. Cilia of fore wing brown practically with apex tipped white and interval between veins 1 and 2 above tornus also white-tipped ; on the hind wing broadly yellowish-white with the bases brown.—Female. Like the male in every respect, perhaps a wee bit lighter in colour, the markings similar. Antennæ in both sexes concolorous with upperside of wings, ringed with white, the club black with the tip whitish below and the shaft also at its distal end ; palpi ochraceous below as also the pectus, the third joint and upperside of palpi and the head concolourous with upperside of wings ; body and abdomen also concolorous with upperside of wings above ; below ochreous but with, in the male, grey black hairs on the thorax; the legs brownish; the tuft of hairs on the hind tibia of male black amongst the ochreous fringe. Expanse: 30mm., the same for both sexes.

In small specimens the two cell-spots are well separated and the dots in interspaces 2 and 3 on the fore wing are entirely wanting both above and below. All these specimens, from which the above description is taken, unfortunately, were bred in the rains. In the dry weather, doubtless the colour would be lighter, possibly the spots smaller (or larger ?) and some of them might possibly be wanting.

Egg.—The egg is in *shape* a dome, circular, the base as broad as the diameter further up the sides. The *surface* is shining, minutely tuberculate generally and sculptured by 14 meridional ridges of which 7 reach a flat, circular surface that forms the apex and is likewise tuberculate in the same way as the rest; these ridges coarse and high, 0·025 mm. in breadth by 0·05 mm. in height, separated by an interspace of 0·2 mm. in the middle of the sides of the egg; the surface is also cross-rayed by low, paralleled rays between these ridges in the top one-third, not cross-rayed on the rest of the surface; the ridges are all rough-tuberculate; the longer ridges are 0·15mm. longer than the shorter and, as a rule, between these; the flat—it is slightly concave—space on apex is between 0·1 and 0·075mm. in diameter. The colour of the egg is a soiled, light yellowish or extremely light brown all over. H. 0·9mm.; B. 0·65mm. with the meridion-prominence, the B. without them is 0·055mm.

Larva.—This is of exactly the same *shape* and type as the larva of *Coladenia dan.* The body is fattest in the middle, circular in transverse section from segment 2 to segment 12-end, the anal end rather fine, the neck or segment 2 about the same width as segment 11; segment 13 a transverse distinct piece little shorter in the dorsal line than segment 12 but having a curved hinder margin, convexly produced in a curve towards anal segment from the spiracular region on one side to the same on the other; the anal segment slightly narrower, as long as 13 and 12 together, consisting of a basal transverse, short piece with a semicircular longer piece in continuation, this semicircular piece convex transversely with four longish reddish hairs directed horizontally out backwards from its margin, one on each side dorsolateral, one spiracular, the hairs as long as segment 13; segment 11 one third as long again as segment 12; segment 10 longer still; the prolegs and true legs all short, the ventral surface flattened as usual so that the " transverse section " of the larva is not really circular as stated above—in larval descriptions we have generally called it so, however. *Head* as broad as segment 3 at front margin and as high, higher and broader than segment 2; more or less quadrate in shape though slightly broader above than at mouth, with a very gradual, shallow sinus on vertex leaving each lobe broadly rounded there; the surface is shining, rather coarsely cellular-rugose, the dividing lines or ridges rather broad, each depression between them set with a single, decumbent, longly feathered, white, shining hair which is about as long as the depression and the feathers about half as long in the middle of the hair, getting smaller towards the tip; the clypeus is triangular, equilateral about one-third the height of the face; the false clypeus about two-thirds the height of the face very broad, arc-shaped but longer than broad; the labrum is transverse, narrow, lightish; the ligula small; the antennal joint both dark-brown-reddish, the mandibles the same, the eyes black; a few longer hairs, simple, about mouth-opening. *Surface* of larva is dull, smooth, the skin thin, covered with minute, well-spaced, short, rather long-stemmed, star-topped hairs that are light in colour and have the rays of the stars consisting of many single hair-like processes; some of these hairs being surrounded by a whitish, slightly raised, circular, collapsed tubercle or something like it; those on the extreme segments 13, 14 form redbrown, lowly conical, shining tubercles—few, funny looking, oval, larger, very lowly-convex, glassy turbercles surrounded by a thin line on segment 14 where the hairs are all longer than anywhere else and where, also, there are 4 much longer hairs pointing backwards—as mentioned already above ; the segments well marked with the usual impressed lines, parallel, in front of hinder margin. *Spiracles* small, oval, nearly flush, whitish ; those of segments 2 and 12 larger. *Colour* of the larva is brownish olive-green with a spiracular, white, thin, somewhat interrupted line and a dark, sometimes interrupted, dorsal line ; the paired bodies between segments 9,10 yellowish, large (in the male) ; the anal segment yellowish, the segments 3, 4 pinkish headed ; segment 2 nearly white ; the sides of the body from spiracular line down lighter as well as the ventrum and legs. L. 20mm. ; B. 4mm.

Pupa.—This is a normally *shaped* chrysalis, fattest in the middle, blunt and square in front, pointed behind, the *head* with the frons in a plane perpendicular to the longitudinal axis of body, the vertex in the same plane as segment 2 and the front slope of the thorax about 30° to that axis or slightly over, the frons rather prominently convex between the eyes, the eyes prominent rounded, the whole piece, including segment 2, quadrate, somewhat constricted behind the eyes, the margins of head and segment 2 straight ; the thorax humped and broadly convex about 4 × the length of segment 2, the apex about half way between front and hinder margin, the dorsal line sloping with segment 4 to segment 5 at a gentle angle ; the pupa constricted shallowly and rather conspicuously dorsally and laterally behind thorax the hinder margin of which is a semicircle curve, slightly produced (though not in the least angled) in dorsal line, meeting the wings in a widely rounded, deep angle of about 60°, this angle limiting the somewhat convex lateral portions of segment 4 laterally and anteriorly ; segment 4 as long as segment 2 in the dorsal line ; segment 5 rather shorter than 4 if anything, segment 6 twice as long ; segment 12 about as long as segment 2; segment 13 little shorter ; segment 11 about equal 12 ; the cremastral (anal segment) a thick triangular piece, the sides concave, the end shortly square, the whole segment 2 × the length of 13, bent down rather strongly, the end set with short, dark-rusty, hooked shaftlets, the hinder margin with a central, quite large, semicircular depression that has its reproduction, though slighter, on the hinder margin of segment 13 ; the dorsal outline behind thorax straight as far as segment 9, then sloping to anal end ; the ventral line straight to near the cremaster then bent down ; the abdomen fattest in the middle of pupa again after the constriction behind the thorax. *Surface* not particularly shining except on thorax, wings and head with segment 2 covered all over with a fairly dense coating of half-erect, very fine, whitish hairs that are as long as segment 13 is long or somewhat less, except on wings and segmental membranes ; the bevilled edges of segments 8-11 sloping, the anterior (segment 9-11) rather steeply, the posterior (segments 8-10) gradually, the former more roughly granulated than the latter though both are very finely so and all are delimited by a rather prominent angle from the rest of the surface ; the venation of the wing well-expressed ; the proboscis produced free beyond the wings to end of segment 12; the hairs on the head are also well developed, those on the eyes being particularly long. *Spiracles* of segment 2 indicated by a broadly semielliptical, convex, dark red-brown, rugose surface with its base on the front margin of segment 3 and lying on the surface of that segment, facing slightly obliquely up and forwards, about as long as half the length of segment 2—not quite; the rest of the spiracles broadly oval, red-brown in colour, very prominent, broadly truncated cones, of moderate size. *Colour* bright emerald-green toned down to glaucous by the clothing of hairs except on thorax, wings, and segments 1, 2 ; the wings whiter as well as the cremaster. L. 14mm. ; B. 4mm. ; H. 4mm.

Habits—The egg, always single, is laid anywhere on the leaf or the leaf stalk. The young larva, when it first emerges, proceeds to the edge of the leaf where it turns over a small, triangular portion of the leaf on to the top, coating the piece thus turned over with a lax cloth of silk and fastening it down all round by a few strings or threads. It lives on the underside of this piece, lying with its head turned round on its side like the rest of the *Sarangesa* and *Coladenia* tribe that we are acquainted with. In all future stages this position of rest is adhered to. After the second moult it folds a leaf by drawing the two edges together with web, often using withered leaves for the purpose ; sometimes, more rarely, even a leaf of another plant that may happen to be lying about or against the foodplant. It is always sluggish in its movements and dislikes the light at all times. The pupa is formed in a roomy cell, coated with silk, made of withered leaves of the foodplant or any other shrub or weed ; and is attached by the tail with a loose body-band that is generally attached by an anchoring-thread to the roof of the cell as described for *Badamia exclamationis*. The foodplant is acanthaceous and may be either *Asystasia* or *Blepharis asperrima*, both low, more or less herbaceous, weeds that are common in the jungles and regions of heavy to moderate rainfall from sea-level up to some thousands of feet. The butterfly flies low down amongst the bushes and grasses with a fairly fast, jerky flight and devious path ; it settles with the wings spread out horizontally at all times and may be met with at all times of the yeai but is, of course, most plentiful towards the end of the monsoon in Bombay ; it visits flowers frequently but never rises to any height above the ground.

Genus 8.—TAPENA.

Colonel Swinhoe gives the following :—

Antennæ.—The club moderately fine, well-hooked, often very much h ooke the tip acuminate.

Palpi.—Porrect, third joint short and obtusely conical.

Hind tibiæ.—With two pairs of spurs, the male with a long tuft of blackish hair lying along its inner side.

Forewing.—Vein 12 ends on costa before end of cell ; discocellulars sub-erect, the lower the longer ; vein 3 emitted about one-sixth before lower end of cell, 2 one-fourth from the base, cell a little less than two-thirds length of costa, the costa evenly arched, apex acute, outer margin straight to vein 2 and inwardly oblique and slightly concave to tornal angle, hinder margin of similar length, nearly straight ; some brown hairs at base—very few—and a short fringe along inner margin.

Hind wing.—Vein 7 from a little before upper end of cell ; discocellulars and vein 5 faint, the lower discocellular the longer ; vein 3 from close to lower end of cell, vein 2 from very little inwards ; costa highly arched in the middle, apex angular, outer margin sinuate and somewhat produced and angled at the end of vein 3, slightly concave above the angling, the wing somewhat square in shape ; the base with longish, brown hairs as far out as middle of disc, with much longer hairs reaching little short of termen on hinder half, the abnominal margin with a thin, short fringe of brown hairs. Cilia concolorous with the wings.

Concerning egg, larva, pupa and habits see below. There is only a single species *à propos* of which Colonel Swinhoe notes : Elwes and

Edwardes have erected two species on account of some differences in the genitalia. They were not able to examine the genitalia of any Ceylon specimens, therefore cannot say how they differ from Burmese and Nilgiri examples. We have examined this species from different localities; we find that the size and shade of colour varies much in examples from the same locality and, for purposes of this work, it is impossible to recognise species that can only be differentiated by the examination of the genitalia of such male specimens. (*Lepidoptera Indica,* Vol. X, p. 60.)

210. Tapena thwaitesi, *Moore.*—Male. *Upperside*:—Dark-brown with a purplish tint. Fore wing. With two subapical, semihyaline, white dots near the costa and, sometimes, a very minute dot below them; an indistinct, discal fascia a little darker than the ground colour of the wing. The species varies in the shade of colour; in some examples it is much paler and more brown than in others, showing the fascia more plainly. Hind wing. Also with discal fascia, not visible in the darker specimens; a white semihyaline dot at end of cell, sometimes absent. *Underside*:—Similar but paler. Cilia concolorous with the wings. Antennæ with the upper half of club dull-ochreous on the underside and a whitish streak below on shaft, the two sometimes one, the upperside pinkish; palpi brown above, ochreous below; head, body above and below and the legs concolorous with the wings. Female.—*Upperside*:—Paler with an ochreous tint. Fore wing. With three subapical spots, more linear and larger than in the male; a larger spot at the end of the cell with its inner margin extending upwards and with a dot between the extension and the costa; a spot below it in interspace 2 rather larger and a dot outside at the base of interspace 3 between the large spots. Hind wing. With a prominent white spot at the end of the cell. *Underside*:—Similar. Antennæ as in the male; a white spot on each side of the collar; palpi greyish-white, with short, brown hairs and a white patch on each side below the eyes. Expanse: 40mm. to 45mm.

The Kanara specimens are uniformly smaller, never over 35mm. in expanse. In the fore wing the dark fascia deciphers into a black spot towards base of cell, another outward in base of interspace 2 with a black mark across interspace 1 below it a little inward; the large semihyaline two spots with black inside edges continued as two dark spots to inner margin; their outer borders also blackish-suffused, connected by blackish suffusion with the black-bordered subapical dots; a submarginal black-suffusion forming a band but interrupted broadly in the middle; in very dark, fresh specimens the whole of the outer disc from end of cell to this last submarginal band is suffused blackish. In the hind wing the markings decipher into a subbasal band, a medial band through end of cell and a postmedial band of spotted appearance with the terminal margin darker also than the general colour. The tarsi of all legs are golden-ochreous; the palpi dull-ochreous in the male, ochreous-grey in the female.

Egg.—The general *shape* is that of a dome with 13 or 14 meridional, sharply-defined, tuberculate, white ribs or ridges on the *surface* which are more or less broken at about one-quarter their length from the apex—some 7 or 8 that is thus broken, the other 6 or 7 continue up to the flat, apical, 7 or 8 sided area, the ridges coming in at the angles; this flat space, and for some distance outside it, is punctuated by little raised, white dots (shortened lines): the flat area itself is bounded by a darker shade than the rest of the egg and has a central, white dot on it (the micropyle probably) and is about one-sixth of the whole diameter of egg in width; the surface between the ridges is nearly obscured by many tiny, very short, white, hair-fine, longitudinal, raised lines, about 9 parallel to each other between every two ribs near the top of the egg, just below the "lid," which lid is that portion of the egg above the break in the meridional ribs—the interspaces between these tiny lines are broader than the lines themselves; hardly shining. *Colour* is green. B. 0· 75mm. H. 0·50mm.

Larva.—The *shape* of this larva is nearly perfectly spindle-shaped; the transverse section circular—except that, as usual, it is somewhat flattened on ventrum—with the anal end narrowly square; the 2nd segment just a trifle broader than the anal extremity, and much narrower than the head which is as broad and high as segment 3 at front margin; segment 13 is half the length of segment 12, a well-defined, transverse piece; the anal segment after it is a perfect trapeze with the extremity about half the width of the anterior margin, the whole segment convex transversely, sloping at about 30° to the longitudinal axis dorsally, overhanging the anal claspers and low on the resting surface; segment 13 has the same dorsal slope; segment 12 is over three-quarters the length of 11; all prolegs and legs are small, short; the body is slightly flanged along the dorsoventral line and is by far fatter in middle than anywhere else. The *head* is large and exceptionally flat, hardly convex on face, very broadly heart-shaped, broader than high, nearly straight across the vertex except for the very slight, shallow, central sinus; surface reticulated all over with comparatively broad, flattened, shining lines, the cells or interspaces being dull, greyish and, of course depressed between the lines; the clypeus is triangular, apex acute, about one-third the height of face; the false clypeus moderately broad outside it from just below the middle, a band with convexly curved (outwards) margins, apex acute, reaching half the height of the face, the surface also reticulated; labrum transverse, rather short, light in colour; ligula broadly kidney-shaped, rusty with darker ends to the broad, deep, frontal sinus; antennal, basal joint light as also the second; mandibles large, strong, broad, light-orange, the ends dark and quite entire (without teeth); the eyes arranged rather abnormally: numbers 2, 3, 4, 6 in a quite straight line, number 1 a little behind, 1 to 4 all equispaced, rather close together, number 6 twice the distance from 4 and number 5 behind 4, on a level with it and further away from it than 4 from 3 for example, all dark coloured; the colour of the whole head soiled orange with a moderately broad, marginal, dark-brown band from the eye-circle up each side and over the vertex, another, less broad, behind limiting the foramen or where the body fits into the head. *Surface* dull and quite destitute of hairs of any description, the segments well marked and the few impressed lines in front of hinder margins punctuate occasionally dorsally. The *spiracles* extremely small, in depressions; those of segments 2, 12 larger; all whitish and broadly oval. *Colour* of the whole larva chalky-white with a slightly bluish shade, opaque, the segment-margins and impressed lines showing thinly dark. L. 24mm. at the most when stretched, and B. 4mm. and slightly over at middle.

Pupa.—The general *aspect* is stout, the anal end pointed, the thorax humped, the head-piece, consisting of segments 1 and 2, quadrate, the vertex of *head* with segment 2 and the front slope of thorax in a plane at about 30° to the longitudinal axis of the pupa; the frons in a plane at right angles to that axis, produced out into a porrect, slightly upturned, conical, rugose-surfaced beak which is as long as the head-vertex; segment 2 a transverse piece not as long as the head and with the front and hinder margins quite straight, parallel to each other; shoulders somewhat prominent but evenly rounded, the dorsal outline of thorax convex, gradually rising from front margin to about one-quarter before hinder margin, then descending to segment 5, including segment 4 in the gradual descent; the hinder margin of thorax a short parabolic curve meeting the wing-lines in a broadly rounded, deepish angle of something over 45°; segment 4 dorsally slightly longer than 5; segment 5 about half segment 6; pupa broadest at middle but very nearly the same breadth there as at shoulders, highest at thoracic apex; dorsal line of abdomen straight, ventral line slightly convex; segment 13 a transverse piece disappearing on the sides of the pupa, convex longitudinally, shorter than segment 12; segments 11, 10, 9 also about equalling 12; segment 14 with a short, truncate-conical basal portion produced into an equally long, nearly perfectly oblong cremaster with tiny hooked shaftlets as its extremity, the whole segment equal 13 + 12 in length; both 12 and 13 with a slight sinus in the dorsal line on their hinder margins; proboscis reaches just to the ends of wings; the antennæ about three-quarters the way; the cremaster is only very slightly bent down. *Surface* shining, thinly transversely aciculate all over except on wings which might be said to be minutely granulate; the segments all well marked; the bevilled edges of segments 8-11 hardly existing on hinder margins of 8-10, sloping and quite well developed on the front margins of 9-11; both margins of segment 13 rather suddenly raised from 12 and 14, hinder margin of thorax rather suddenly higher also than the adjacent surface. *Spiracles* of segment 2 are slits, linear, between segment margins 2, 3 bordered by dull-white, broadish bands on each side which are differentiated from the surrounding surface only by being dull instead of shining, about as long as segment 2 or only slightly less; the rest of the spiracles small, oval, dull, opaque white. *Colour* waxy looking white with a translucent greenish tinge on wings, thorax and head; the only colour about being the reddish cremastral hooked shaftlets. L. 18 mm.; B. 4·5mm.

Habits.—The eggs are laid singly on the young shoots; the egg larva after emerging turns over a long section of the edge on to the top, parallel to the midrib, the section adhering, by a narrow stalk left at its middle, to the leaf; the larva lives upside down on this turned-over piece coating it with silk. When full grown it places one leaflet over another nibbling pieces out of the edge all round. The change to pupa takes place in such a cell and the chrysalis is attached by the tail and a body-band inside. The cell is always rather laxly lined inside with silk. The larva is sluggish and does not like the light and lies in its cell with the head turned round on the side as often as not. The places chosen for oviposition are generally shady, out of the sun and the leaf is always a young one. The larva lives on young or youngish leaves at all times. Often there are many eggs laid on a single tree or bush and banks and the sides of nallas are favourite places. The imago is a strong flier, rises at times high up in the air, is moderately fond of flowers and has a jerky, devious flight. At all times it rests with the wings horizontally extended, always slightly bent down at the ends. The foodplants are *Dalbergia latifolia*, the Rosewood or Blackwood or Shisam found all over Western India, *Dalbergia tamarindifolia* and *rubiginosa*, both large climbers of the Western Ghats. Sumatra, Borneo, Ceylon, South India are given as the distribution. It is very common in the North Kanara District of Bombay and is met with in the vicinity of Dharwar town so that it is more than probable it is to be found wherever there is a rainfall varying from 300 inches to 30 inches wherever its foodplant is to be found, either at sea-level or 3000′.

Subfamily (2).—HESPERIINÆ.

This is a somewhat unsatisfactory subfamily but forms the best intermediary group between the butterflies with horizontally spread wings when at rest and those with wings held perpendicularly closed over the back, that is between the *Celænorrhinæ* and the *Ismeneinæ*. Colonel Swinhoe characterises it as under :—

Antennæ.—Club robust, more or less straight, curved in *Thanaos* and *Carcharodus*. *Palpi.*—Suberect, the third joint blunt.

Hind tibiæ.—Two pairs of spurs, the upper pair very minute in *Thanaos* and *Carcharodus.*

Fore wing.—Vein 12 ends on the costa before the end of the cell; discocellulars suberect; vein 3 arises shortly before the lower end of the cell, 2 from before the middle; the cell is about two-thirds the length of the costa.

Hind wing.—Vein 7 arises just before the upper end of the cell, 3 from just before lower end, 2 from the middle—in *Carcharodus* a little more inwards, in *Thanaos* a little beyond the middle.

And he informs us also (*Lepidoptera Indica,* Vol. X, p. 95) of some interesting facts concerning the group :—

" In this subfamily we put *Hesperia,* Fabricius ; *Spialia,* Swinhoe ; *Pyrgus,* Hübner ; *Caracharodus,* Hübner ; *Thanaos,* Boisduval ; and *Gomalia,* Moore.

" The first three were put by Watson into sections under *Hesperia,* but he himself states that it is a genus that wants splitting up.

" Species of the first three genera are distributed all over the world, except in the Australian region ; *Thanaos* and *Carcharodus* are palæarctic, *Gomalia* is apparently confined to South India and Ceylon.

" Doherty says that the eggs are small, hard, seven-eighths as high as wide or even higher, constricted at base, with wide scalloped anastonosing ribs, remarking that this group is very distinct and includes *Hesperia* and *Gomalia.*

" The life history of typical *Hesperia* is well known, the type *malvæ,* Linnaeus, being a common English species ; for the life history of *galba,* Fabricius, the type of *Spialia,* we are indebted to Davidson, Bell and Aitken ; their habits of life are very different."

We know that the eggs of *Hesperia malvæ* at home in England (The Grizzled Skipper) and those of *Thanaos tages* (The Dingy Skipper) are dome-shaped and strongly ribbed with some 20 smooth-backed ribs with cross-rays between them that are much finer and lower. Those of *Hesperia* (*Spialia,* Swinh.) *galba* are exactly of the same type also. But that of *Gomalia* is very different in sculpture though more or less the same as will be seen if a reference is made to its description below under *Gomalia albofasciata.* The larvæ of *Hesperia* and *Spialia* are very similar, those of *Thanaos* and *Gomalia* have more or less naked heads, thus different from the others which have a clothing of long, more or less erect, blackish hairs ; all the heads are, however, round, rather bullet-shaped. The pupæ of all of them are somewhat alike, having large, spiracular expansions to the spiracles of segment 2, a well-formed, more or less triangular cremaster, the thorax humped, the colour green or yellowish. The habits of the larvæ of *Hesperia, Spialia, Gomalia* are similar in the matter of manufacture of the cells and the caterpillars' way of lying in them ; the pupation offers no great difference of method in the various genera—that is in the three that are known in India; *Thanaos tages* at home seems to make a different sort of cell to the other three. In the matter of habits of the butterflies themselves there are important differences in the way the wings are held in repose. *Hesperia* (*Spialia*) hold them perpendicularly over the back as do all the *Ismeneinæ*, *Pamphilinæ*, *Erynninæ*, &c. that come after them in classification. *Thanaos*, according to available information, rests with the wings penthouse-wise like most moths. *Gomalia* assumes both or either of these positions indifferently as will be seen under that insect further on. They all agree in that the larvæ feed only upon dicotyledonous plants. The butterflies are all quick in flight, frequent low herbage and live in the open country and, in India, always, with the exception of *Spialia galba* (*Hesperia galba*), at levels above 2,000 feet above the sea. *H. galba* is found at all heights, even along the sea-shore.

Genus 9.—HESPERIA.

Quoted as under, following Swinhoe in *Lepidoptera Indica*, Vol. X:—

Antennæ.—Less than half the length of costa of fore wing, the club robust arcuate, blunt at tip, with no terminal crook.

Palpi—Suberect, second joint laxly clothed with longish scales, third joint slender, blunt, almost concealed by the scaling of the second.

Hind tibiæ.—With two pairs of spurs; no tuft of hairs in male.

Fore wing.—Vein 12 not straight but slightly recurved before bending up to the costa, ending there some distance before the end of cell; discocelluars suberect, the lower the longer, vein 3 emitted a little before lower end of cell, 2 from a little before middle; cell a little less than two-thirds length of wing; costa arched at base, then nearly straight to apex, the apex and outer margin evenly rounded; no costal fold.

Hind wing.—Vein 6 emitted quite close to the upper end of cell; discocellulars and vein 5 very faint; vein 3 from immediately before lower end of cell, 2 from a little beyond the middle.

Swinhoe has the following genera, based mostly on male characters of wings and legs:—

A. Male with no costal fold to fore wing .... *Pyrgus.*
B. Male with a costal fold to fore wing.
    a. Male with a pair of scabbard-shaped, scaly and hairy appendages springing from the breast posteriorly at base of hind legs and about one-third the length of the abdomen .... *Hesperia.*
    b. Male without these appendages.
        a^1 Antennæ with the club absolutely blunt in both sexes.
            a^{11} Wings on the upperside spotted all over with numerous white spots .... *Spialia.*
            b^{11} Not so.
                a^{111} Hind wing dark-brown, immaculate .... *Thanaos.*
                b^{111} Hind wing with white band .... *Gomalia.*
        b^1 Antennæ with club minutely apiculate .... *Carcharodus.*

Only *Spialia*—Which will be called *Hesperia*—and *Gomalia* need trouble us here. But it is interesting to know from Colonel Swinhoe that "Lang says that the position of the wings of *Hesperia* *cashmirensis* during repose is different from that of the butterflies of any of the other families, the hind wings being held in a horizontal position, the fore wings only half erect; the wings are never closed perpendicularly over the trunk, the inner margin of the hind wing is not deflected but is thrown into a slight fold, so that there is no canal for the reception of the abdomen." This gives another position for the wings in the family. Of course *Hesperia* (*Spialia*) *galba* often parts the wings too *when basking* in the sun, keeping the hind wing nearly horizontal while the fore wings are half opened; it has never been observed that the hind wing was anything but quite horizontal although the fact that it was may have been taken for granted. It may possibly be held as for *Hesperia cashmirensis.*

211. Hesperia galba, *Fabricius*—Pl.M., figs. 80 ♂, 80a ♀.—Male. *Upperside*—Black with slight olive tint, spotted with white. Fore wing with three spots in the cell, subbasal, medial and terminal; a spot on the submedian vein below the subbasal spot; a discal series of eight spots commencing with three that are subapical and close together from near costa in interspaces 6, 7, 8, then two together in 3 and 4, the lower the larger followed by two larger and more or less conjugated a little inwards in interspaces 2 and 1 and one still further in on the submedian vein; a complete submarginal series of small spots, one in each interspace 7 to 2 and two in 1; four short, white streaks on costa between middle and apex; there are a few white scales at base of the wing spreading along costa and inner marginal area for some way; inner margin with short brown hair fringe. Hind wing with a subbasal white spot in cell, a large, somewhat quadrate white spot at the end of the cell with a smaller one below it in interspace 2 and a still smaller one above it interspace 6; a submarginal series of small spots from anal angle becoming obsolete upwards; some longish grey-whitish hairs on hinder part of wing and a short, white fringe on abdominal edge. Cilia of both wings checkered black and white. *Underside*:—Grey of a shade variable with the locality and with a certain area of fore wing nearly always brown; the hind wing always very much greyer. Fore wing with the spots as above but larger, the apex, inner margin and costa rather broadly grey, the rest of discvery much lighter brown than the upperside, all the spots similar, perhaps a little larger. Hind wing with the abdominal fold bluish-white; three subbasal spots in cell, interspace 1 and interspace 7, this last with even a further one indicated in 8; the spot at the end of the cell forming part of medial, transverse whitish band with irregular margins from costa to abdominal fold; submarginal spots as on upperside; the ground colour of the hind wing is often ochreous brown of a greyish shade due to a thick overlaying of the brown ground colour with very light brownish-ochreous scales; the edge of abdominal margin with a fringe of white hair. Antennæ brown above spotted with white, the club sometimes tipped chestnut but pure white below with most of the club chestnut; palpi, head and body above concolorous with wings, the abdomen banded with intersegmental, narrow bands of grey; beneath everything white including legs. Female. Usually darker than the male, markings similar, the spots of upperside often smaller. Expanse up to 25mm.

Egg.—Dome-shaped, perfectly rounded on top where, centrally, is a depressed micropyle. Surface shining and covered with small, 0·0.5mm. × high tubercles, irregularly hemispherical in shape and arranged in meridional lines: 20 or 21 such lines all round the egg, only about 8 actually reaching the circumference of the micropyle-depression, all the others shorter. Colour pale grass-green with the tubercles whitish; on the whole the meridions are very regular though not quite. B.0·7mm.; H. 0·5mm.

Larva.—The body is in *shape* somewhat like a spindle, the anal end somewhat narrowly rounded and held rather high off the surface, the claspers being perpendicular beneath it, short; fattest in the middle decreasing in width to both ends about equally, segment 2 much narrower and lower than head, orange-brown of a light shade with a transverse, narrow, black collar nearer hinder margin broken by a light, thin, dorsal line ; legs and true legs short ; *head* comparatively very large, round, deep, rugose, shining black, covered with fine, close, light yellowish fur on the face and set with very long (comparatively), erect, black and white hairs (some are longer than the head is broad) some of the black ones being longest and stout, thickening to their extremities ; the front of the face has only short, white hairs, longest about the mouth-opening ; clypeus hidden by the fur ; labrum and ligula orange-brown ; mandibles black. *Surface* of body covered fairly closely with tiny, white, truncated-concal tubercles (say 26 to each transverse row from the dorsoventral margin on one side, to that of the other side) each of which bears a long, white or brown, erect hair, the brown ones confined to the front part of the body ; the segments are well-marked and there are the usual, transverse, parallel, depressed, fine lines to each segment, in front of and parallel to the hinder margins. *Spiracles* broadly oval, small, brown-yellow in colour, flush ; those of segments 2 and 12 much larger. *Colour* glaucous-green with a darkish, dorsal, pulsating line and a whitish, spiracular line. L. 16mm. ; B. 4mm.

Pupa.—Stout, in *shape* more or less cylindrical from shoulders to end of wings, then conical to end ; the head-piece square broader than long, slightly " bossed" between the eyes which are themselves prominent, the vertex convex; segment 2 long, convex ; thorax slightly humped and evenly convex; shoulders evenly rounded ; a slight constriction behind thorax ; the body is fattest at middle and slightly broader there than at shoulders ; the abdomen curved down : cremaster transversely convex, short, square, hollowed out ventrally, narrow, set with a dense tuft of hooked shaftlets at extremity ; from fore-end to end of wings is about two-thirds the total length of pupa ; hinder margin of thorax nearly a semicircle meeting the wings in a broadly-rounded, deep angle of about 80 . *Surface*, all except the wings, covered with long, white, fine hairs, densest about eyes and on head ; all the segments well-marked; the hairs are all about as long as segment 2, appressed more or less to surface ; the proboscis reaches free beyond the wings only very slightly. *Spiracles* of segment 2 have large expansions oval, convex, transverse, standing out from surface of the thorax, dark chocolate-brown in colour with a slit down the middle; the other spiracles small, oval, light-brown in colour, more or less flush with the surface. *Colour* of body greenish-yellow or light yellowish-green ; of thorax, wings and head, green ; of cremaster, brown ; suspensory hairs or shafts bright golden. L. 12·5mm. ; B. 5mm. H. nearly equals breadth.

Habits.—The larva doubles up part of a leaf on top or underneath, fastening it down tightly all round and lining the inside thickly with silk ; before turning into the pupa makes a strong cell by lining the inside still more thickly. Of course it changes the cell as often as necessary during growth to suit its size—it always fits the body fairly closely. The pupa is covered all over with a white, creous powder excreted by the larva. The pupa is attached by the tail very strongly and seems to have no body-band. The larva rests inside with its head turned round on its side. The egg is laid on leaves, stalks, shoots or grasses near at hand. The foodplant is *Waltheria indica* (*Sterculiaceæ*), a low, often inconspicuous weed, growing flat against the ground amongst the grass ; although it does grow erect where opportunity offers. It is common throughout the country from the sands of the sea-coast to the open plains of the Deccan, fields, grass-lands, all places. The little larva is very sluggish in its movements and does not like the light although inhabiting the sunniest, openest situations. The butterfly flies fast and keeps to the ground, being fond of flowers and the sunlight. It basks on the ground or leaves close to the ground and, when doing so, keeps the wings open half-way, the fore wings in a different plane to the hinder ones which are generally held nearly horizontal. At night it rests on grasses, flower-heads, &c. with the wings closed over the back and may be caught with the fingers in the early misty and dewy mornings when numbed with the cold. When flying it is very difficult to see as the checkered grey and black blends well with the sunny ground and grass-shadows : besides, it is very small and quick, although it never flies very far. It is more difficult to see, even, than the smallest of the Indian skippers, *Aeromachus* which is dark-coloured and not nearly so marked—indeed it is not at all protectively marked. The habitat is India, Ceylon and Burma, and it is found in regions of heavy rain and in the driest places where the rain is slight ; in hills and plains, in forest or open country at all elevations. Swinhoe says "Recorded from the Chin Hills by Watson, and Pungadaw, Upper Burma ; by Manders from Fort Stedman in the Shan States ; it is a common species throughout India and Ceylon and has been recorded from many localities ; we took it at Poona, Bombay, Mhow, Karachi and have it from Ranikhet, Kurnal, Raipur, Madras, Kandy and the Khasia Hills and it is in the British Museum also from Barrackpur near Calcutta, Ganjam, Ootacamund, the Shan States and Burma. We cannot separate *Pyrgus evanidus*, Butler (Swinhoe places this insect in the genus *Pyrgus*), from *galba ;* his type from the Habb River, just outside the Sind border, was taken by us : it only varies from *galba* in its smaller size and in having the white, discal band of the hind wing on the underside more or less broken up ; in *galba* it is complete ; we took many examples of both sexes of *evanidus* in Sind, all in mid-winter ; it is undoubtedly the extreme cold-weather form of *galba.* Yerbury took it at Campbellpur in the cold weather. Our figures of the larva and pupa are from Davidson's original drawings, bred at Karwar."

The insects are represented on Plate M, figures 80 and 80a, male and female respectively. They are fairly good but the female is too red on the underside as usual. The red dot at base of fore wing at inner margin should not be there. The abdomen of the male is too black.

Genus 10.—GOMALIA.

According to Swinhoe characterised as under :—

Antennæ.—With a somewhat slender club, blunt at the end, no terminal crook or sign of one, not half the length of costa of fore wing.

Palpi.—Suberect, second joint clothed with longish scales, the third blunt, more or less concealed by the hairs of the second.

Hind tibiæ.—With two pairs of spurs, more or less of equal size, the terminal ones thicker; fringed lightly with longish, white hairs in both sexes on the outside.

Fore wing.—Vein 12 ends on costa well before end of cell, 11 at end, level with it; discocellulars suberect, the lower very slightly the longer; vein 3 emitted before lower end of the cell at a distance from and about equal to lower discocellular; 2 from before middle; cell a little more than two-thirds the length of costa, costa slightly arched, apex subacute, outer margin evenly convex, shorter than the inner margin which is nearly straight. The surface of wing covered with decumbent, white hairs fairly closely, the inner margin with a short fringe of them. Male with a costal fold.

Hind wing.—Vein 7 from close to upper end of cell, 3 close to lower end; discocellulars and 5 very faint; costa lightly arched at base, outer margin evenly rounded; hinder half of wing clothed with long, greyish-white hairs and fringe of similar, shorter ones on edge of abdominal margin.

There is only one species; descriptions of *egg, larva, pupa* and *habits* will be found below.

212. **Gomalia albofasciata**, *Moore.*—Male. *Upperside.* With the ground colour brownish olive-grey. Fore wing with a basal blackish-brown band and an antemedial darker band, the latter with its outer margin limited by a thick, black line which extends from the subcostal vein to the submedian vein in an outward curve, the portion in the cell edged by a semihyaline somewhat lunular mark closing the cell; a semihyaline, yellowish-white spot at the base of interspace 3, another inwards below it in interspace 2, almost touching the one in 3; a curved series of three contiguous, subapical, semihyaline similar small spots in interspaces 6, 7, 8 and, sometimes one still smaller below in 5 with a rather large dark, quadrate patch on costa limiting the series inwards; a similar, but smaller patch at apex of wing; a larger dark patch at middle of outer margin extending triangularly inwards to the spots in interspaces 2 and 3 and bordered by a whitish shade; another brown patch at tornal angle, longer, extended along inner margin then along outer, also bordered whitish above; the hair-covering and fringe along inner margin as for genus. Hind wing darker than the fore wing, brown with a broad, white, medial band from vein 7 to the abdominal fold and a white subbasal mark in the cell on the nearly quite black basal third of the wing; a black band bordering the white, medial one outside, narrowing upwards, bordered in its turn by a whitish shade beyond which the terminal portion of surface is black with a grey wash at tornal area and a white, terminal patch at end of vein 5; longish grey hairs clothing the hinder half of wing, the abdominal margin-edge fringed white. Cilia of fore wings brown with some grey scales; of hind wings nearly pure white except at anal angle where they are brown and grey. *Underside*: grey. Fore wing really brown overlaid with grey scales which become brown outside the cell and below it except for the internomedian interspace along the inner margin which is white extending somewhat up into the submedian interspace, right up to vein 2 in a quadrate patch under the semihyaline spot in interspace 2, a bit inwards of it; the semihyaline spots as on upperside, silvery; but none of the other markings. Hind wing; also brown overlaid with whitish scales and with white hairs in the cell; the subbasal cell-spot and broad medial, white band present, the latter extending right up to the costa, the cell-spot joined to another white spot, a bit outwards of it, in interspace 7; the abdominal fold blue-greyish, the anal angle with a short, white submarginal band running up from it and the white patch on outer margin between veins 4 and 6

just indicated. Female. Larger, lighter in colour above and below. Fore wing above is similar to that of male, the hind wing also. *Underside*: With grey decumbent hairs in cell and along costa above cell not found in male; markings similar to male, larger in both fore and hind wing. Antennæ concolorous with wings above, speckled with white on the shaft but with the club black, white below; body and abdomen concolorous with wings, above, white below, the abdomen with light intersegmental bands; palpi with third joint concolorous with wings, white below.

Egg.—Is peculiar in the sculpture. It is dome-shaped, somewhat depressed rather less than twice as high as broad. The surface is rather dull and occupied by coarse, somewhat irregularly-rounded prominences, or knobs of considerable size; occupying the top of dome is a lid, circular in shape, quite half the diameter of the whole which opens to allow the little larva to emerge; this lid is composed of six very broadly-club-shaped convex prominences surrounding the micropyle-surface in the centre which is also circular and takes up the central third of the lid, the narrow ends of the club shaped prominences touching each other round this surface; surrounding this lid is a series of circular (more or less) prominences to the number of twelve, the series not quite regular, very nearly touching the lid prominences; outside this is another series of rather more knobs and beyond that another, three in all. When the larva is ready to come out it eats away the intervals between the clubs, leaving them quite intact and connected by the micropyle-surface; this lid, then a star-shaped piece with six broad rays, comes away, allowing free egress. The colour of the egg is white when first laid becoming reddish-orange later on with the rays and knobs always white and concealing most of the ground colour. B. about 0·90mm.; H. about 0·5mm. B. of lid about O. 3mm.

Larva.—*Shape* is more or less the usual shape of all skippers: the transverse section a circle flattened on the ventrum; the anal end is narrowed from behind the middle of body to extremity, the 13th segment being apparent, as along as half the 12th and divided into two parts by a line transverse to the body; the anal segment is nearly semicircular in outline and overhangs the anal prolegs slightly: the curve is very even and the edge thin, the dorsal slope being about 308 to the longitudinal axis of the larva; the thickest part of body is just before the middle whence it thins gradually to segment 3, segment 2 being still narrower, the head about the same diameter—perhaps slightly less, the neck short but distinct, the head being certainly broader and higher than it; the prolegs and anal claspers are short and held well beneath the body as in all butterflies, the true legs also rather short. The *head* is rather broader than high, otherwise nearly circular and has a shallow, very broad and gradual vertical sinus or curve dividing the two lobes; the clypeus is triangular but hardly noticeable, being one with the rest; face rather flattened; surface of head hexagonal-celled rugose minutely, hardly shining, covered all over fairly densely with erect, plumose, brownish, short hairs, nearly wanting on the vertex of the head and simple on clypeus; the labrum is shining, short, transverse, the ligula also short, broad, shallowly sinuate in middle anteriorly, both the same colour as the whole head though the labrum in some lights looks lighter; the colour of head, antennal joints, eyes, all very dark red-brown, nearly black. *Surface* of body dull, transversely thinly lined near margins of segments, the segments not at all constricted; the whole covered all over with small, densely disposed (not enough to hide the skin in any way), fine, white translucent, erect hairs which are branched into 2 and 3 short branches at their extremities; besides a fringe of longer, soft, erect also moderately plentiful hairs along dorsoventral margin, densest and longest on anal segment; all quite distinct under a lens and each rising from a minute colourless tubercle. *Spiracles* very small, roundly oval, light soiled yellow, those of segments 2 and 12 much larger. *Colour* soft villous.

looking white with a greenish shade and indications of a slightly darker dorsal line; ventrum, legs and prolegs light green; segment 2 is nearly smooth except for the lateral posterior portions. L. 20mm.; B: 4mm.

The penultimate stage is the same; the antepenultimate has a thin, black collar across middle of segment 2, transverse; the one before that has the whole of segment 2 black; the egg-caterpillar, again, has the thin, black collar.

Pupa.—Is an ordinarily *shaped* little chrysalis broadest just at shoulders, the same breadth practically continued to segment 7 middle, after which it decreases gradually to segment 9 and more rapidly afterwards to the pointed cremastral end; circular in transverse section in all that portion (from shoulders to segment 13); segment 12 equalling 11 in length, segment 13 being half the length of 12 and the anal segment a broad, short triangle with the apex produced into a dorsally and ventrally flattened, somewhat down-curved, parabolic piece, half as broad as the posterior margin of segment (or anterior margin of segment 13), the apex of parabola or end of pupa set with a bunch of golden-brown, hooked shaftlets which are half as long as the segment, by which it is attached to little pad of laxly-spun, white silk. The front of the pupa is broadly blunt, formed of the lowly and broadly rounded or convex frons of the head between the somewhat prominent eyes of which only the top portions are narrowly visible from above and separated from each of these by a minute, sharp sinus; the lateral outline to shoulders being formed thereafter by the outline of these eyes further back and a small portion of the front of the thorax, for the head is somewhat bowed and the frons low, so that the dorsal and ventral head-surfaces are separated only by a low bit of the frons which is in a plane at right angles to the longitudinal axis of the pupa; the change from the ventral aspect and from the perpendicular frons to the vertex is of course gradual and rounded; the vertex of *head* is rather broad between the eyes and, chiefly, between the bases of the antennæ, it is in a plane at about 45° to the longitudinal axis and segment 2 and the front half of thorax are also similarly inclined; segment 2 is rather short, only moderately convex transversely and straight along both posterior and anterior margins (*i.e.*, these margins are quite parallel to each other transversely across pupa); the thorax is very moderately humped (convex longitudinally, and transversely) highest about the middle (may be a little before) which is the highest point of the whole pupa, thence gently sloping to hinder margin which is a somewhat broad parabolic curve meeting the wing-line in a very broadly rounded, rather deep angle of 45°; the visible part of segment 4 thereafter is, in the dorsal line, the same length as segment 5 and this latter is somewhat shorter than segment 6; indeed segments 5-11 are about equal in length; the ventral line is straight from head to near the ends of wings where it is very slightly convex, then slightly concave to end, as the end is somewhat turned down; the proboscis is free at its extremity from the end of wings to near the hinder margin of segment 9, the wings themselves being slightly produced at their apices: the proboscis is stout, very slightly broadened toward extremity and then somewhat bluntly pointed. *Spiracles* of segment 2 are large, oval, very prominent raised perpendicularly from thorax-surface on hinder margin, slightly convex transversely and longitudinally on front face, the colour light brown with the hinder margin black; the rest of the spiracles are small, oval, convex, light brown with black central slit. *Surface* of pupa is somewhat dull, aciculate-striate very superficially on thorax, rather distantly, minutely pitted on abdomen, more or less smooth on wings, shining on segment 14; the whole surface except wings and the major part of cremaster, covered with short, erect, fine nearly white, sometimes minutely bifid hairs all over; this again all powdered with a white cereous powder more or less thickly. *Colour* very light, dead-yellow somewhat flushed brown on dorsum of the whole pupa, darkest on segments 1-3; the end of proboscis dark-brown; the cremaster soiled, lightish brown-orange. L, 12mm.; B, 4mm.

Habits.—The egg is laid on the top surface of a leaf, not necessarily a particularly young one; the little larva eats the lid free and goes to the underside of the leaf at once where it cuts itself a small, nearly round cover from the edge, leaving it attached at a point on the edge and turns it over onto the underside. It fixes this down and lives under it, coating the inside with silk laxly and eating in the immediate neighbourhood. In the next stage it cuts a much larger, more or less square or oblong, piece from the edge inwards and turns it, generally, onto the upperside, living underneath and coating it with silk as usual, after fastening it down all round. Finally it doubles a whole leaf sometimes. None of the fixing-down after the first cell is particularly tight. The pupation takes place in a more tightly-woven and strongly closed cell, often made of young leaves which wither and fall or get caught up somewhere; so that, presumably, the cell is as often as not made amongst withered leaves or in a withered leaf.

One egg was found on	8th June 1916.
Larve emerged therefrom	10th ,, ,,
Changed into second skin	12th ,, ,,
Changed into third skin	14th ,, ,,
Changed into fourth skin	18th ,, ,,
Changed for last time	24th ,, ,,
Pupated on the	3rd July 1916.
Butterfly emerged on	16th ,, ,,

giving about forty days for a generation. The larvæ are shy of a very bright light and, in consequence, feed in the immediate vicinity of their cells on the leaf upon which it has been made. They are not particularly sluggish and sit in the cell at rest with the head turned round on the side. The butterfly flies quickly and in spasmodic starts and jumps so to speak; it settles on a leaf and is gone. It appears to fall off or jump off but that is about all that can be seen. It visits flowers in the mornings and afternoons. During the day, in the intervals of flight, it sits with the wings raised half way between the horizontal and perpendicular, the upper half of fore wing, the apical part that is, bent down slightly, the fore wing normally separated from the hind wing. In the mornings and evenings, when resting, the wings are generally held horizontally out, the costa of the fore wing at about 45° to the axis of the body or, in other words, the fore wing covering the hind wing partially. It has been observed resting at nights with the wings held perpendicularly over the back as in *Parnara*, *Hasora*, &c. The foodplant of the larva is malvaceous and it has always been, so far, *Abutilon indicum*, Sweet, a common weed all over the Deccan, in the Plains country. The insect is never found in the jungles or hills being apparently confined to regions of light rainfall above 2,000 feet level in Bombay. It is common in Dharwar, Poona, Khandesh Districts. Swinhoe says the type came from Ceylon; that it exists at Karachi in Sind and he took it at Poona and has it from Madras and from Quetta; Evans records it from the Palni Hills and Moore from Kangra. He says it is a scarce species, though widely distributed within India, Ceylon and Baluchistan.

(To be continued.)

BIRDS' NESTING WITH A CAMERA IN INDIA.

By

CAPTAIN R. S. P. BATES.

PART I.

(*With* 6 *plates.*)

THE SIND AND LIDDAR VALLEYS, KASHMIR.

It was towards the end of June 1920, that I left Srinagar by tonga in time to reach Ganderbal at the mouth of the Sind Valley before tiffin. After this having arranged pony transport for the next morning, I went out into the rice fields to look for nests of the Northern Ruddy Crake (*Amaurornis fuscus bakeri*). My efforts were not attended by much success, as I returned to camp very wet, very dirty and perspiring freely from the efforts of plodding through 18 inches or so of soft mud, having been shown one nest, which was said to have been ravished the previous day, and having flushed a brooding female off another but newly completed. However it served to strengthen my opinion that this crake prefers rice fields and ditches to large reed-covered jhils, of which more elsewhere.

The first day's march was not worthy of note, as the Sind Valley is here very open, and the avifauna differs little from that of the main valley. Beyon finding some sort of Willow-wren's nest containing young ones, and seeing a pair of Red-headed Buntings (*Emberiza luteola*), I noticed nothing of outstanding interest. Willow-wrens and warblers are most confusing birds. Many have such slight differences, that unless one is prepared to shoot on sight, and then examine the shattered remains with the aid of a book, it is usually impossible to say for certain to what species the victim belongs. Thus the identity of this Willow-wren, whose nest I found on three other occasions, all containing small young ones, remains a mystery, although I suspect it to be the Greenish Willow-warbler (*Acanthopneuste nitidus viridanus*). The owner of the nest in question showed itself to be a creature of fixed habit. In a cavity in a branch, the nest had two entrances, or rather according to the tenant an entrance and an exit, as it invariably went in at the top hole and reappeared, when the excitement, which the sight of food always seems to create in children, had somewhat died down, out of another hole about a foot further down the trunk. I have often noticed this trait in birds. A Tailor-bird, which had its abode in a creeper on the verandah of a bungalow I was recently occupying, always pitched on the lowest branch of the creeper, and hopped up invariably by exactly the same route to its nest some four feet higher up. And a Red-flanked Bush-robin (mentioned later on) had the same trick as the Willow-wren, entering its nest, which was under a fallen stump, from one side of a piece of loose bark and leaving from the other. In this case I was able to observe that both the male and female did likewise.

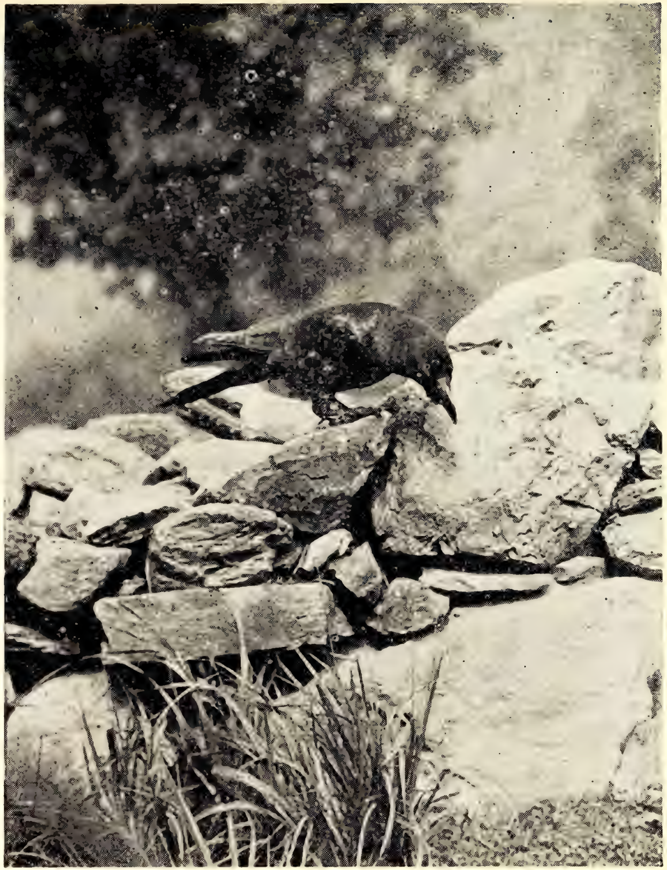
The next day I succeeded in finding a Plumbeous Redstart's (*Rhyacornis fuliginosa*) nest containing three young ones. This was on the underside of a stump overhanging the river, which was now a raging torrent of intensely cold snow-water. This made the getting of photographs a rather unpleasant job, as I had to fix up the camera in the water. The Plumbeous Redstart has all the attributes of the true Redstarts with a great partiality for water thrown in. It is a restless Robin-like bird with a short tail, which it is continually vibrating, and which is of totally different colouration in the two sexes. In the female the base of the tail is white, and this white increases on the outer feathers towards the outside, the outermost feather being almost entirely white. The remainder of the tail is bluish brown. That of the male is wholly bright-chestnut. They effect every mountain torrent and all the side rivers of Kashmir up to considerable elevations, but are not to be found in the main valley, wher the current is sluggish. They feed on the insects on the wet rocks, and sometimes flutter into the air after winged prey. The nest is cup-shaped and made of moss and roots and is lined with hair and wool. The situations chosen are a ledge, well concealed by grass and ferns, the underside of an overhanging tree-trunk, sometimes a fork of a tree, or the masonry of a bridge, and are nearly always overlooking the water. The eggs, four in number, are white, thickly mottled and spotted with yellowish and reddish brown, and are about ·76″ by ·6″.

At Gund I began to meet with the Eastern Meadow Bunting (*Emberiza cia stracheyi*), evidence that the bed of the valley was steadily rising, as I have never found this bird lower than a thousand feet above the main valley. This Bunting is the favourite dupe of the Asiatic Cuckoo, but it was now rather too late to hope to find the latter's egg. At Koolan I found two unusual nests of this species, as they were both substantially built cups well off the ground in bushes. The usual nest is rather a flimsy affair placed at the foot of a bush, in the side of a bank or in long grass. The eggs remind one strongly of the Yellow-Hammers', often having the same pencilling, though not usually to such a great extent. I also obtained one most curious egg of this species here, a light grey ground with a zone near the large end of thin concentric circles of a dried-blood colour.

For two reasons I decided to remain one day at Koolan. Firstly because I had decided to cross over into the Liddar Valley, and Koolan is the starting point, and only the previous day there had been a very bad storm, covering the hills with snow down to a thousand feet or so of the valley, probably rendering the Yamhar Pass (13,400 feet) uncrossable. Secondly because from the bushy slopes just above my camp came the far-reaching and long-drawn-out whistle of the Pale Bush-Warbler (*Horornis pallidus pallidus*), a small insignificant bird with a wonderful voice and a still more wonderful egg. There is no need to describe the bird as its notes are frequently uttered and absolutely unmistakable—a plaintive monotone, which one can never quite locate, and which goes on until one feels the bird must collapse from sheer exhaustion. When it does eventually come to an end, it is finished off by two quick sharp notes. It also possesses a rather feeble song. The nest is an untidy globe of grass lined with feathers; but the egg a rich uniform purple brown.

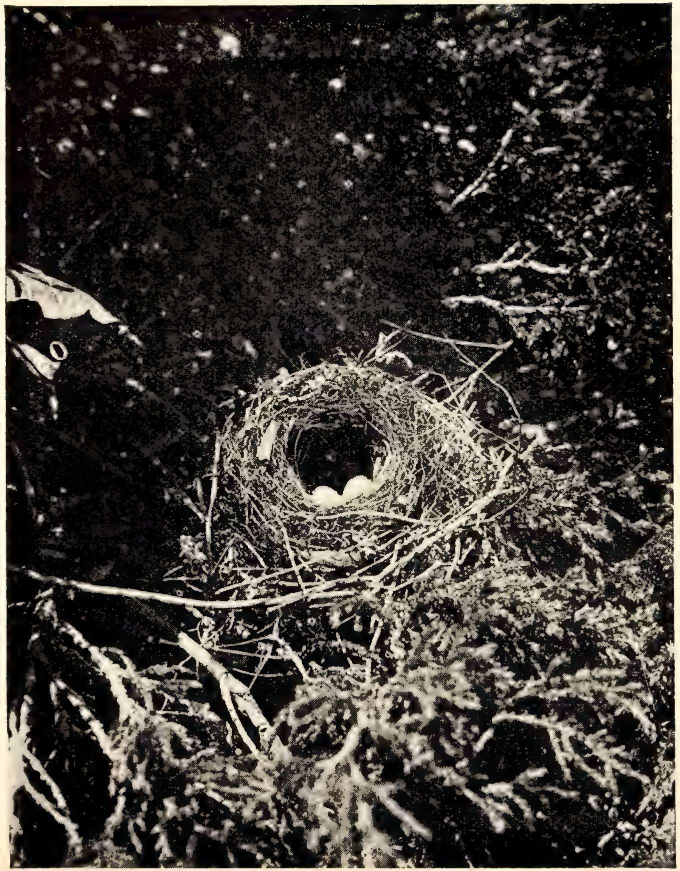
I entertained great hopes of finding a nest, as but a week before a friend had taken one near Srinagar containing four fresh eggs. I had no luck, however, and, returning to camp, consoled myself by taking photos of Jungle Crows (*Corvus coronoides intermedius*), which I enticed into range with pieces of a vile and uneatable plum cake, a ghastly attempt on the part of my cook. The Jungle Crow of Kashmir is a far finer specimen than that of the plains. The bird of the Nilgiris nearly approaches to it, but is I think considerably smaller. There is an even greater difference in the eggs. I was shown a clutch taken at Kotah in Rajputana, which were little if any bigger than Indian House Crows'. Whereas those I have seen taken in Kashmir are about as large as Carrion Crows. The markings too are much pronounced.

The first stage of the appallingly stiff ascent to the Yamhär yielded little beyond perfect views, and even these were few and far between, as the thick deodar forest afforded one but few glimpses of the snow-capped hills, into which one was mounting. When perhaps about 2,000 feet above the valley, *i.e.*, about 9,000 feet up, I came across a Small-billed Mountain Thrush (*Oreocincla dauma dauma*) on its nest among the exposed roots of a deodar. This bird is an exceedingly close sitter and I made an abortive attempt to catch it. I really believe it would have allowed me to photograph it as it sat, and I regret that I did not make the attempt. Once flushed it made off straight down the hillside and never put in another appearance. There were four eggs in the nest, which was made of roots lined exclusively with pine-needles. Three of the eggs were

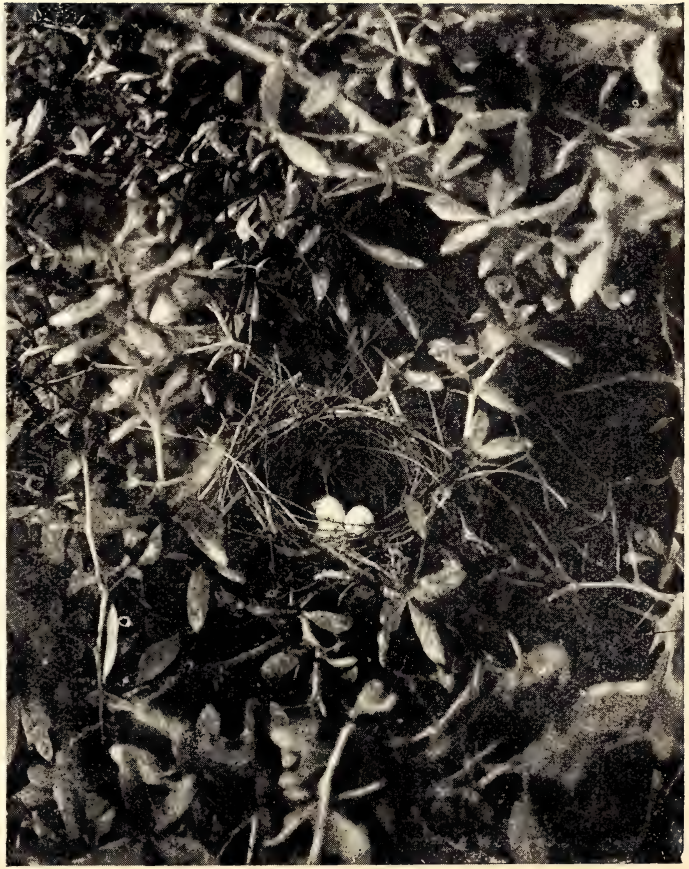


THE HIMALAYAN JUNGLE CROW (*Corvus coronoides intermedius*).

THE EASTERN MEADOW BUNTING (*Emberiza cia stracheyi*).



JERDON'S HEDGE-SPARROW (*Prunella strophiatus jerdoni*).



HUME'S LESSER WHITE-THROAT (*Sylvia althea*).

normal, a greenish white background specked with pale reddish. The fourth was rather a freak, being very large and having the markings collected in a band round the larger end. The sitting female reminded one strongly of a Song Thrush (*Turdus musicus*), owing, I suppose, to the wearing down of the fulvous margins of the feathers.

Shortly after this I espied a Grey-headed Ouzel (*Planesticus castaneus castaneus*) with its beak full of wriggling insects. After watching it for some time, I came to the conclusion that its nest was somewhere in a low bank just below me. As I was on the point of jumping down, a movement caught my eye and there, where I had intended landing, was a beautifully marked but very evil looking viper just uncoiling itself. I disposed of it hastily with my khudstick, and then discovered that it was evidently there with the intention of satisfying the inner snake, as there too in a slight depression was the Ouzel's nest with two naked young in it. This is the only time I have ever found a Grey-headed Ouzel's nest on the ground. A decayed stump seems to be a favourite site, and I have found them more than 10 feet up against the side of a tree trunk.

I was now at about 10,000 feet and the nature of the forest began to change, birch becoming increasingly plentiful. With this change the avifauna too showed distinct alterations, Flycatchers, Nutcrackers and evidence of a large Woodpecker becoming numerous. I frequently noticed a little Robin-like bird, which I find I described in my diary, written at the time, as " a little earthy coloured fellow with a white throat and abdomen, *red* flanks and large inquiring eyes, which obviously say : " Who on earth are you. If you mean mischief, go away." Its peculiarly suspicious manner struck me afresh at every encounter. This was the Red-flanked Bush-robin (*Ianthia rufilata*), the female. The male is a much darker bird, having the upper plumage and a patch on the cheeks, extending down the neck and on to the sides of the breast, a dark blue. It has an ultramarine blue eye-stripe, upper tail-coverts, rump, and median wing coverts, and of course the red flanks. They are possessed of a very hoarse danger note like the rasp of a file. I eventually found the nest containing young, which I mentioned earlier on in this chapter. This was procured close to camp at Zaiwan : Zaiwan consisting of a post to mark the camping ground dug into the centre of a small grassy marg looking out across the forest clad snow-capped valley. Three thousand feet below and but three miles distant across the tops of an unbroken sea of firs lay the Sind river, a narrow gleaming ribbon emerging from the frowning narrows of Gangangair. After arriving in camp and while refreshing myself with a cup of tea and the glorious view, I was visited by a Jungle Crow with two distinct white wing bars. I had also noticed one just before leaving Koolan, which had a large white patch in the left wing.

The next morning commenced with the most strenuous exercise I have ever experienced. In just over half a mile measured across the contours, but probably entailing twice that amount of walking, the path rose 1,500 feet. I had to content myself with plodding steadily upwards, and only took note of my surroundings during the many rests my overtaxed lungs forced me to take. The forest, which had for some time consisted exclusively of birch, here became stunted and soon ceased altogether. And so far I had drawn a blank. Some two and-a-half miles further on lay the pass, apparently a mass of snow and probably quite uncrossable, but in between lay grassy slopes dotted with patches of juniper bushes and many small streamlets of ice cold snow water.

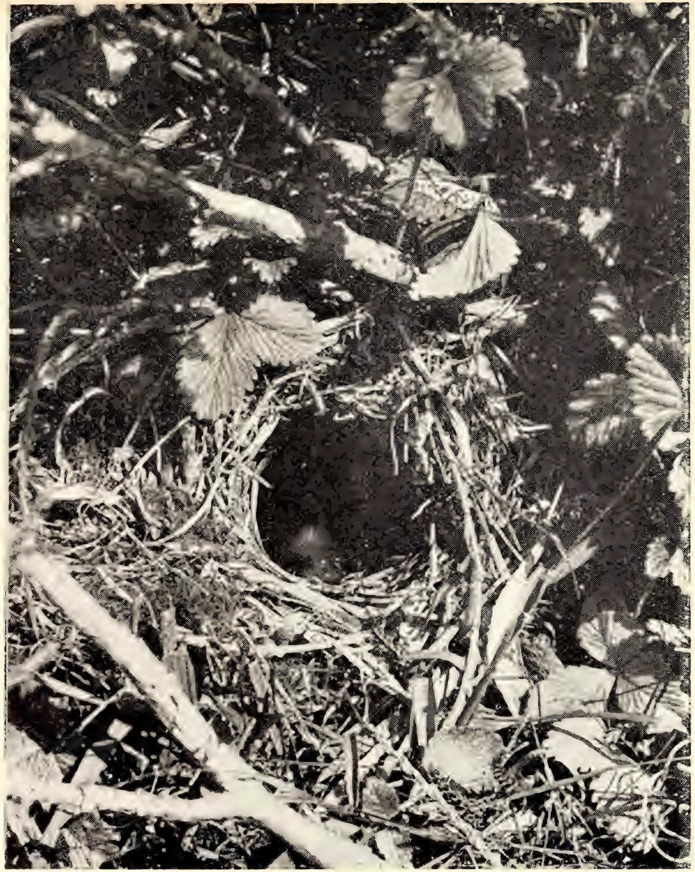
The path, thank Heaven, ascended but very gently to the foot of the pass. The very first juniper patch, I investigated, yielded a small compact nest composed of roots and moss, lined with hair and a few downy feathers, and contained three beautiful blue eggs. Nest and eggs might have been those of a Hedge-Sparrow transported straight from home. They belonged indeed to Jerdon's Hedge-Sparrow (*Prunella strophiatus jerdoni*). Later I found many more nests mostly being built, others containing but one or two eggs, but none as yet with their full compliment. This first nest was at an elevation of no less than 12,200 feet and was the highest I obtained, though I am sure that there were still more to be had at higher elevations.

At the foot of the pass, 12,500 feet, many Hodgson's Pipits (*Anthus roseatus*) were to be seen running round the edge of Kem Sär, a small half frozen tarn, and when I was laboriously pulling myself up the side of the Yamhär itself, feeling like an exhausted fly on a window pane, an Eastern Blue Rock Thrush (*Petrophila solitaria pandoo*) flew out of a mass of rocks I was crawling through, and seemed very agitated at my presence. Between 13 and 14 thousand feet hardly seems a suitable elevation, at which to bring up a family. The only other birds I noticed in this region were the inevitable Jungle Crow and the Lammergeyer (*Gypaëtus barbatus grandis*).

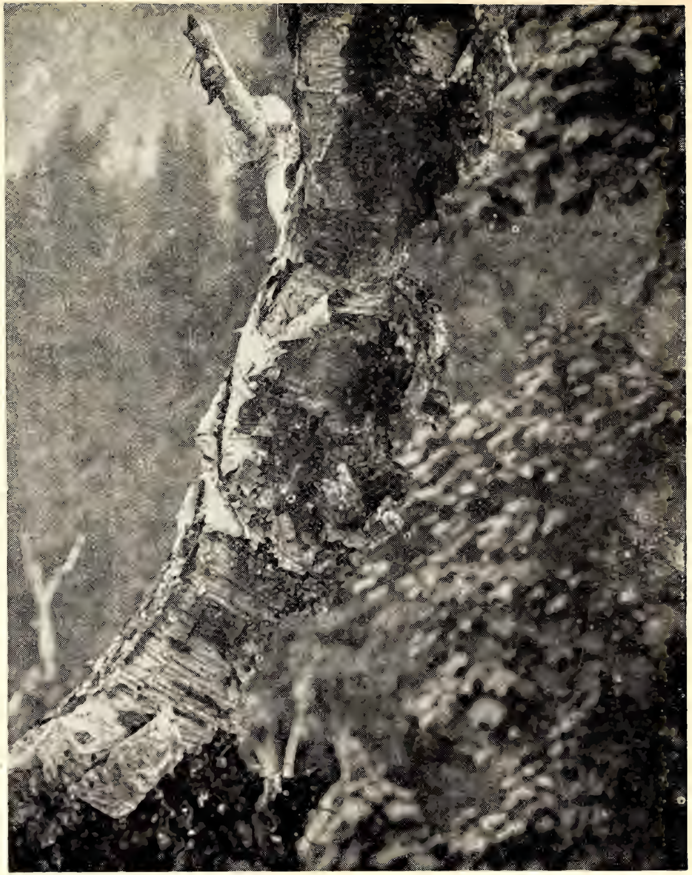
As soon as I had crossed the pass, which I was able to do by pulling myself up a narrow chimney, which the driving snow had left more or less clear, and which was about half a mile to the left of the actual road, and brought one out about 200 feet higher, I fell in with a bird for which I was especially on the look-out, namely, the Yellow-billed Chough (*Pyrrhocorax graculus*). The nature of the country was here very different. A narrow valley, commencing in a semicircle of towering cliffs, descended more or less gently for some ten miles, eventually debouching into the Liddar Valley at Liddarwat. The right face of the valley was dominated by snow-covered heights of 15,000 feet or more. Himalayan Griffions and an occasional Bearded Vulture were to be seen like tiny specks, closely following the line of the cliffs. From the left bank of the tiny stream, which grew in volume with almost every step, rose grassy slopes strewn with masses of tumbled rocks, the homes of numerous marmots. Everywhere were patches of melting snow, forming tiny rivulets, at the edges of which many Hodgson's Pipits were feeding. Other vegetation there was none.

I pitched camp at Sekwas (about 11,250 feet) three miles down the valley. Here on the left too there was a massive perpendicular cliff, at the foot of which the patches of Juniper made their reappearance. Choughs were very plentiful. Bands of them sported overhead, one moment flying steadily like any serious crow, the next swerving, tumbling, and rolling earthwards in a peculiarly careless flight, the wind eddies amongst the broken cliffs probably accounting for these weird antics. The Yellow-billed Chough, slightly smaller than the Common Indian Crow is black plumaged, the wings and tail highly glossy, and has a short and practically straight yellow beak and red legs and feet. I was told by a friend, who was at this time at Sonemarg, which is not far distant and at about the same elevation, that there the red-billed variety (*Pyrrhocorax pyrrhocorax*), in which the bill is long slender and curved, was common, while not a Yellow-billed Chough was to be seen. The cliff was apparently their breeding place, as on two occasions I saw Choughs fly out to mob a Griffon Vulture, which had ventured too close. It was of course absolutely unscaleable, so I had to content myself with a distant view of their haunts.

July started with great promise. Two most interesting nests being found within a few yards of one another in the Juniper patch below the cliff: the first that of Tickell's Willow-warbler (*Phylloscopus affinis*). This was a loose sphere of grass about 5 inches in diameter with an entrance in the side. It was lined with Chough feathers exclusively, and held two minute and almost oval white eggs. One appeared to have a few microscopic red spots on it. The nest was only about a foot from the ground and very imperfectly concealed. I am sorry to have to confess that on this occasion I committed murder, as being the only means of establishing the identity of the bird.



THE EASTERN WHITE-SPOTTED BLUE-THROAT
(*Cyanosylvia cyanecula abbotti*).



THE HIMALAYAN SOOTY FLYCATCHER
(*Hemichelidon sibirica cacabata*).

[illegible] REDSTART ([illegible])

THE DARK-GREY BUSH-CHAT (*Oreicola ferrea ferrea*).

The second nest was of even greater interest. It was let well into the roots of a bush, and was semi-domed, rather like a coconut with a piece cut out of it. Altogether it was about 7 inches in diameter with an entrance hole about 2½ inches across. It was composed of grass, with a lining of goat's hair, and there were four eggs, rather pointed, light blue with red markings at the larger end. They were very like large editions of the Indian Bushchats. I regret that on this occasion I did not have resort to the gun, but I was never quite certain as to who was the owner of the nest. I was unable to sit down and wait for it to return, as it was already late. I had struck camp in the morning and sent the coolies on ahead, and I was now further from my objective, Lidderwat, than when I started. As to the female I can only go by the story of the shikari, who found the nest by nearly putting his foot on it, and who, incidentally, having been engaged to find bears, was by this time quite convinced that his sahib was a little touched. According to him she was an earthy coloured bird with whitish underparts, and ran from the nest, sneaking someway through the bushes before finally taking to flight. One cannot however go by an Indian's description. Should he catch the flash of a small patch of red on an otherwise brown bird, it is quite on the cards that he would say the bird was "lal." A black and white bird might be either black or white but not both. However, I find I have also written the following in my diary; "A bird, which may have been the male, was the same with a blue throat and upper breast and about the size and shape of an English Robin." This bird came quite close to the nest when I was about 20 yards away. I am, therefore, of the opinion that it must have been the nest of an Eastern White-spotted Bluethroat (*Cyanosylvia cyanecula abbotti*), which, I believe, is not supposed to breed within Indian limits. If any of my readers have also found this bird breeding in the Himalayas, I would be most delighted to hear from them.

One other nest besides numerous Hedge-sparrows' fell to my lot. A Hodgson's Pipit (*Anthus roseatus*) flew from under a stone by the side of a sheep-track, along which I was walking. The nest was the typical pipit nest, but the eggs were very much darker than the usual pipit's, having a distinctly purplish tinge about them. There were three in the nest. I was lucky to get a nest with eggs, as there were many young birds about. Hodgson's Pipit is a small dark pipit, and in summer is only to be found at high elevations. They are rather partial to water and stoney ground. In fact I never remember meeting with them on dry ground. They seemed to prefer feeding on the wet stones of the streams and round the edges of the tarns, running and fluttering about like wagtails. They have a sweet little song and the habit of most larks and pipits, but to a more marked degree, and when still some considerable height from the ground, of cocking up the wings and tail and fluttering down like a dead leaf or a butterfly at the mercy of the wind.

Descending below the 10,000 feet level, White-capped Redstarts (*Chaimarrornis leucocephala*) and Brown Dippers (*Cinclus Pallasii tenuirostris*) became increasingly common. Himalayan Whistling Thrushes (*Myiophoneus horsfieldi temminckii*) were numerous from a higher level. Choughs were now nowhere to be seen. I had the luck to bring down a Snow Pigeon, the White-bellied Pigeon (*Columba leuconota*) of the "Fauna" (1st Edition), out of a flock, which suddenly burst round some birch trees, which were once again in evidence. Fine heavy birds with a strong swift flight they are, and really beautiful to behold. Like great balls of snow with wings grey, banded with brown, the primaries darker inclining to brown at the tips, a dark slate grey head, pale earthy brown upper back, and upper tail coverts and tail blackish brown, the latter having a broad crescent-shaped white cross-band.

I reached Liddarwat about 5 p.m., having used every plate I had out with me, and feeling in consequence that I had had a very successful day. Unfortunately the photographs of the Willow-warbler's nest turned out failures; one being moved, the others for some reason I cannot now recall.

My tents were pitched on the left bank of the river on a little open space surrounded by birch and deodars, the latter predominating. The valley at this point is narrow and the hills immense and precipitous, yet thickly wooded to a considerable height. Here the sun rises late and sets early, great black shadows creeping over the river and darkening the opposite hillside in the early afternoon. The air is delightful, crisp and fresh in the morning and pleasantly warm during the daytime. I decided therefore that here was a charming spot to rest. I discharged the coolies, and made up my mind to remain until I felt inclined to move on, with due regard to the unhappy fact, that the powers that be claimed my presence amongst the barren hills of the north-west frontier in but 15 days time.

I had evidently struck one of those peculiar patches of forest, in which for some unaccountable reason all the birds of the neighbourhood seem to be collected. It may be that the feeding in such spots is superior to that in the surrounding tracts, but I often doubt that this can be the true reason, as to outward appearances at any rate there is often no difference in the vegetation or ground whatsoever, and, consequently, one would conclude, in the food supply. Nevertheless for some 300 yards above and below my camp the place teemed with birds; and beyond this limit the forest was as still as death. My tent was besieged by Jungle Crows; bands of noisy Tree-creepers dashed piping shrilly from trunk to trunk across my grass plot; Pied Woodpeckers would converse with one another in stacato tones; a family of Dippers gambled in the foaming waters and a Himalayan Whistling Thrush down by the river spent all the hours of daylight and most of the night in addition either mimicking every individual member of the avian chorus in turn, or roundly swearing at anything that might threaten its two hefty fledglings, sitting on a branch below it. Flycatchers literally teemed, and every now and then the sweet lay of a Kashmir Wren poured forth from a fallen trunk or moss covered boulder.

The first morning I passed repacking with greater care the negatives I had so far obtained, and after tiffin took up a commanding position about 200 yards from my tent door with my back against a tree, and proceeded to note with the the aid of binoculars and my own eyesight the doings of the feathered population. By this means within a couple of hours I had marked down the nests of no fewer than two Sooty Flycatchers, a White-browed Blue Flycatcher, and two Large Crowned Willow-warblers. A Grey-headed Ouzel had a nest behind an enormous boulder, which prevented me from discovering its exact whereabouts. A Red-flanked Bush-robin evidently had its nest somewhere in the vicinity of a fallen deodar, but would not disclose its position, and a Kashmir Wren was busily feeding a large family amongst a small pile of undergrowth almost at my feet.

One is hardly likely to find the nest of the Himalayan Sooty Flycatcher (*Hemichelidon sibirica cacabata*) except by the above means. The bird realises thoroughly the advantages of camouflage, besides which it more often than not builds on a horizontal moss-covered branch or close up against a tree-trunk. The nest is small, and so in the former case from below merely gives one the impression of a slight thickening in the branch. The materials used are largely moss and lichens, and so closely resemble their surroundings. The lining material is hair. It is placed at anything from 15 to 40 feet or more from the ground and generally in a fir tree. The eggs 3 to 4 in number are pale green heavily speckled with reddish, and measure about ·65″ by ·46″. The breeding season is extensive. I have found nests being built and containing young in May, June and July. Both sexes are inconspicuous in coloration, but conspicuous otherwise, as they choose some high vantage point, to which they return again and again after frequent sallies in pursuit of winged prey. Why do birds feed so seldom on butterflies ? One would expect such fat luscious morsels to be at a premium. Yet I can recall few occasions, on which I have seen them molested, and then I have noticed that they are not always easily caught, being adepts in the art of dodging and swerving.

The Large Crowned Willow-warblers' (*Acanthopneuste occipitalis occipitalis*) nests both contained young ones. One was at the end of a narrow hole in the ground about a foot deep : the other well inside the decaying end of a fallen pine. The Crowned Willow-warblers are distinguishable by the yellow eye stripes and an additional stripe running from the forehead over the crown. They invariably give away the presence of their nests by a continual loud "teeing" whenever one is in their vicinity.

The White-browed Blue Flycatcher (*Cyornis superciliaris*) though a true flycatcher is rather different in structure and habits from the last named of the family, being rather slender in build. There is considerable dimorphism in the sexes, the male being entirely dark glossless blue above with a white eye stripe, and white below. The blue extends down the sides of the neck on to the breast, forming a partial collar. The female is in no way resplendent, being brown above with pale buff underparts and having dark spots on the crown of the head. The nest was about 7 feet from the ground in a cleft in the trunk of a birch tree, and was an extraordinary structure. First came a foundation of moss and on this a loose structure of thin strips, about 1/8 inch in diameter, of the skin of birch bark. It looked for all the world as if the builder had stolen the paper shavings out of a box of chocolates. A scanty lining of hair finished it off. Unfortunately the building operations were over, as there were three fresh eggs, so heavily speckled with biscuit brown as to completely hide the ground colour. They were slightly darker at the large end. They had a high gloss and a comparatively hard brittle shell and in size averaged ·6″ by ·5″. The male was by no means timid, and often came to admire his property, while I was quite close.

The following morning I returned to the same area, but took up a slightly different position. I was soon rewarded by discovering the whereabouts of the Grey-headed Ouzel's (*Planesticus castaneus castaneus*) quarters. These were somewhat unusual, being 12 feet or so above the ground in a thick tangle of small branches sprouting from the trunk of a large tree, of the name of which I am ignorant. Large feathered young ones were in possession, so I left them severely alone, not wanting to make them leave home prematurely, and so become prey to some ruthless marauder. Young birds are very perverse creatures : once startle them into leaving the nest, and it is often impossible to make them remain in it again ; no matter how many times one puts them back.

Just behind me in the roots of another large tree was a nest of the Kashmir Wren (*Troglodytes troglodytes negleeta*) containing five young ones, some three or four days old. The Kashmir Wren resembles quite closely the English Wren in size, shape and habits, but is much barred and darker in hue, which readily serves as a factor in its identification. The nest is in no way different, and I have also found unlined nests just as one finds them at home.

While watching the Grey-headed Ouzel, the evolutions of a Sooty Flycatcher had attracted my attention. Every few moments it would fly past the same spot in the side of the dead birch, at the foot of which I had posted myself. I could see nothing unusual about the place beyond some loose flaps of bark. There was an enormous boulder close by, on to which I climbed. From this point of vantage, I found myself looking into the nest shown in the accompanying illustration. It contained three eggs in an advanced state of incubation. Allowing my gaze to pass beyond, I was surprised to catch sight of another nest of the same species on a horizontal branch of another birch a few yards further down the hillside. From my commanding position it was most conspicuous, but from anywhere near the tree it was almost unnoticeable. It turned out to be empty, but next morning was found to contain one egg. I took this egg and put in its place one of the well incubated ones from the other nest. What a shock the parent birds must shortly afterwards have sustained, finding themselves saddled with a hungry child some days before scheduled time. The eggs in the first nest averaged ·65″ by ·5″ and were distinctly greenish, and the specks rather faint and brownish though just as profuse. as usual. The single egg was of a slightly lighter shade and the markings normal.

During both my vigils I was visited by a Blue-headed Rock-thrush (*Petrophila cinclorhyncha*) a truly beautiful bird, and nothing like his soberly arrayed cousin the Eastern Blue Rock-thrush (*P. solitaria pandoo*). His head and throat were dressed in cobalt blue, ear coverts, back and the greater part of the wings, but for a white patch, and the tail in black, and the upper tail-coverts and entire under parts in bright chestnut. The primaries and greater coverts, and the tail feathers less so, are edged with blue. His abode I think must have been higher up the hillside. I could hardly expect his nest too to be in that little paradise. In a square of certainly not more than a hundred yards, in the space of a few hours I had found no less than the following nests—4 Sooty Flycatchers'; 1 White-browed Blue Flycatcher's; 2 Great Crowned Willow-warblers'; 1 Kashmir Wren's, and 1 Grey-headed Ouzel's. How many more were there, that I had missed? Why there must have been millions as the rustic answered, when asked how many thousandths there were in an inch.

Next day I decided to go to Kolahoi glacier, where the river takes its source, one of the sights of Kashmir, the mountain from which it springs being nearly 18,000 feet. I wasted the entire morning trudging along the left bank frequently getting tied up in side nullahs and plodding through silent deodars, which gradually gave way to birch and finally came to a straggling end, as one steadily mounted. For the first two miles or so the woods were uncannily silent, hardly a living thing to be seen, and I drew an absolute blank, merely coming across a couple of old Tree-creepers' (*Certhia himalayana himalayana*) nests, both of which, by the way, were only about 3 or 4 feet from the ground, and seeing a couple of families of the Red-flanked Bush-robin (*Ianthia rufilata*). Once a flock of Snow Pigeons (*Columba leuconota leuconota*) went hurtling past within easy range, but I was empty-handed, and had to content myself with admiring their beauty of form and flight.

Walking once more by the river's edge, I saw many Brown Dippers (*Cinclus pallasii tenuirostris*) and eventually disturbed a pair of Plumbeous Water-robins busily engaged in supplying the wants of a nestful of chicks. This was in a most unwonted situation, being not less than 50 yards from the water, and at least 15 feet from the ground in a hole in a tree. As if wishful to show that the exception proves the rule, the parents were void of all caution, and even went on feeding their charges while I was photographing the situation.

Above this, about 10,500 feet, I don't remember meeting with this species again, but White-capped Redstarts (*Chaimarrornis leucocephala*) were numerous, and appeared to have nests to judge by their actions when one commenced searching likely spots. However, I was unsuccessful as far as they were concerned, until, in the very last copse through which I passed, I saw one enter a stump with a piece of building material in its bill. The nest was almost completed, only requiring to be lined.

It was now pretty late, and I had still a couple of miles to go to reach the glacier, so nesting operations for the day perforce ceased. Even as it was, I I did not reach camp again until well after dark, feeling pleasantly tired after being on the move for some 10 hours with but a short break for a picnic lunch.

HODGSON'S PIPIT (*Anthus roseatus*).

THE HIMALAYAN WHISTLING THRUSH (*Myiophoneus horsfieldi temminckii*).

After leaving Liddarwat, Aru was my next halting place. This was a charming little village surrounded by considerable cultivation and open park-land. A short but wide side valley harbouring a mountain torrent of the same name provided the necessary space, rendering possible the village's existence, which incidentally was the first I had encountered since leaving Koolan.

I took up my quarters by the stream and some half mile from the village. There was now a decided difference in the heat of the sun, as the bed of the valley was rapidly dropping, and I found myself eager to take advantage of any shade that offered itself. As I was thus idly watching from the shelter of some bushes the last remnants of what must once have been a large snow drift, being rapidly eaten away by the fast flowing water, a female Plumbeous Water-robin flew down from a cleft in the rock a short distance away and commenced quietly feeding on the wet boulders in midstream. Apparently she never saw me sitting motionless in the deep shadow. A few minutes later the male, who had all the time been feeding a little way away, came downstream and joined her, and the two played about together for upwards of half an hour, after which the female flew up to the nest and the male returned to his former and evidently favourite feeding ground. I remained watching the whole morning and not once did the male go to the nest. The female once again left her post for a short period to snatch another hasty meal.

It thus dawned on me, why I had previously been unable to find the nest of this species except by chance. How many dozens of times had I seen pairs of them playing about the water's edge with seemingly no cares and nothing to do but enjoy themselves the live-long day. These I had left alone or watched for but a short time, but when I had espied a solitary male I had said to myself, "Now surely his lady is sitting, so soon he will take food to her." The result was that after watching him (through glasses as a rule) till my eyes ached, I reluctantly gave up the struggle and the riddle remained unsolved.

It is apparent that the male does not take food to his consort, but she, when she thinks the coast is clear, leaves the nest and fends for herself, and being of a cautious disposition does not return again, until she is pretty certain that she is unobserved. Hence I counsel as follows—watch the females or even the pairs, making certain you have not been spotted, but it is a waste of time to concentrate on a single male.

Half a mile up stream I had the opportunity of putting the above into practice, with the result that I found another nest in much the same sort of situation as the first. It was a difficult nest to get to, and entailed a wetting, so I left it alone. The first nest held four hardset eggs.

Another interesting problem was solved that day, as far as I am concerned at any rate, though I am open to correction, if I have drawn too hasty a conclusion. By the end of May I have found many evacuated Himalayan Whistling Thrushes' (*Myiophoneus horsfieldi temminckii*) nests, and during this trip too I had noticed numerous young birds about. I now found within a few yards of one another two nests, one soiled, and evidently finished with, the other containing two quite fresh eggs. Not far away were two more nests, as before one given up, while the other, overhanging the water as usual, was clean and tidy but as yet empty. Before leaving Aru, however, it contained eggs, which unfortunately met with a tragic end. I photographed it from a bank, which slightly overlooked it, but was unable to see how many eggs it contained. It was too high up to get to from the ground, so Habiba, the aforementioned shikari, climbed onto a coolie's shoulders, and was thus just able to reach it with a stretch. The stretch proved fatal. He lost his balance, and in an attempt to save himself clutched at the rock-face. His fingers closed on the edge of the nest. The agony was not prolonged. A bedraggled shivering wretch (the water was icy cold) was soon ashore, but the nest and some broken egg-shells were being swept rapidly seawards.

However to return to my guns. After leaving Aru, I observed three more nests in each case with the bird sitting. Two were inaccessible; the third was still empty. Though it was now the second week in July, it was evident that the great majority of birds were laying. It, therefore, seems to me more than probable that the Himalayan Whistling Thrush has two broods in the year, the first about April, the second about July.

The nest of this species is a massive well constructed cup of moss grass and roots lined with finer grass, and is invariably placed on a ledge or the side of a boulder, and always close to the water. Often a nest is seen on such a narrow or sloping shelf, that it seems almost to be defying the laws of gravity, but it will be found to be firmly fixed, being more or less cemented to its bed by the dried mud amongst the moss of which it is composed. They are not as a rule far above the water, but I remember once noticing one on the opposite side of a narrow and immensely deep gorge, which could not have been much under 200 feet above the torrent below. They are fine looking birds, black with glistening light blue tips to the feathers of the neck and breast. These spots, however, are only visible at close quarters. Thus at a distance they closely resemble the Blackbird, being of the same clean build and also having a yellow bill. They are, however, considerably larger, an adult male attaining a length of some 13 inches. They have a large variety of notes, a pleasing song, and are also excellent mimics. At times, however, especially when in attendance on a family of youngsters, the many noises they produce, the volume thereof, and its unceasing flow are enough to get on the strongest of nerves. The eggs are greyish, more or less covered with very light brown specks, and are rather elongated. The shell is hard, slightly pitted and glossy. They average about 1·4″ by 1″, and 3 to 5 are laid.

On leaving Aru I noticed a Kashmir Cinnamon Tree Sparrow (*Passer rutilans debilis*) carrying material to a hole in a gnarled tree-trunk, while on the next tree a Kashmir Wryneck (*Iynx torquilla japonica*) matching the bark to perfection, was hunting for insects.

Some two miles above Pahlgam, while walking across a patch of shingle, a Hodgson's Pied Wagtail (*Motacilla alba hodgsoni*) flew from under a large stone at my feet. A nest was disclosed containing 5 eggs, which on testing one of them in the river, turned out to be quite fresh. This rather surprised me, as by the end of May practically every nest I found contained young ones. Possibly this was a second brood, or they may have been unlucky in previous attempts to raise a family.

Just after leaving this nest, I disturbed a Western Spotted Forktail (*Enicurus maculatus maculatus*), feeding at the edge of a small stream, which flowed across the path.

I had just come to the conclusion that this day's operations were over, as I was now approaching Batakot, where I intended staying the night, when a soberly coloured little bird—evidently a female chat of some kind—caught my eye. It was fussing about a branch but a few feet away from the path, with what looked like a caterpillar in its bill. I walked on watching it out of the corner of my eye, and had the satisfaction of seeing it fly to a deodar, and from there to a scraggy wild rose at its foot. I was unaware of its identity, so remained where I was, and was soon rewarded by the advent of the male, who, I was glad to observe, was doing his fair share of feeding his offsprings. It was a Dark-grey Bushchat (*Oreicola ferrea ferrea*). For a moment one almost mistook it for a shrike of some kind, as it has a decidedly long tail, is black above, and white below with a white wing patch and a white line above the eye, altogether giving it a most shrike-like appearance when in flight. The nest was a scanty contrivance of grass with a few feathers for lining, and contained three newly hatched downy chicks.

I was in the act of photographing this nest, when another female of the same species flew down into the roots of a hazel some 30 yards distant, so when I had finished, I transported my camera to this spot and here discovered a nest containing 4 eggs. They were on the point of hatching, one being already chipped, and a second showing signs of a slight ridge, where the file on its occupant's nose was already working through. The eggs were typical Bushchats, blue green with reddish markings mostly at the large end, and measured about ·7″ by ·55″.

This to all intents and purposes finished my outing, as I spent the next day walking hard, covering the 19 miles to Khanibal, where I found the Houseboat awaiting me. 36 hours later I was in the post office in Srinagar, where I was rather annoyed to find that a telecentric lens, that had been on order for the best part of a year, and which might have been useful on one or two occasions, had arrived the very day I left for the Sind Valley.

I had had a most interesting 18 days, very successful too, when one takes into consideration the fact that I was on the move practically every day, and this is by no means conducive to success. One will invariably find far more by stationing oneself in a likely spot and observing with glasses, than by any amount of actual searching on the march.

Still who could have wished for a pleasanter holiday than this. These valleys of Kashmir are indeed an ornithologist's paradise. Combined with an ever changing mass of bird-life, one has before one's eyes the finest scenery in the world. Here are unfolded great sweeps of forest-class hillside; there vivid green slopes, dotted with the herds of wandering gujars. Again immense dark chasms present themselves, in the gloom of which foaming torrents deafen one with their ceaseless din, while above all, touching the very vault of Heaven, gigantic tumbled masses rear their snow-capped heads through the billowing clouds. Oh ! to watch again of an evening from one's tent door the deepening shadows in the valley below, and the ever-changing kaleidoscope of rainbow colour thrown by the setting sun on the glistening snows above, while recalling at leisure the events of a successful day. May it be soon !

(*To be continued.*)

OBSERVATIONS ON THE BREEDING HABITS OF SOME FRESH WATER FISHES IN THE PUNJAB.

BY

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Superintendent of Fisheries, Punjab.

(*With two plates.*)

The observations on the breeding habits of *Cyprinidæ and Siluridæ* were carried on in their natural spawning grounds from 1921-1923, while of *Ophiocephalidæ* were recorded from Departmental ponds at Madhopur and Sirkian. The measurements and weight of gravid females were taken and the total number of eggs obtained by weighing the whole mass and then weighing a small portion carefully and counting it as a basis for a calculation.

Species of fish.	Weight.	Number of eggs.	Number of eggs per lb. (40 tolas) of weight.
	Tolas.		Approx.
Labeo rohita	410	19,05,000	1,85,854
Labeo calbasu	120	4,86,600	1,62,200
Labeo calbasu	160	7,39,400	1,84,850
Labeo gonius	18	2,900	6,444
Labeo micropthalmus	19	3,400	6,105
Cirrhina mirgala	132½	2,16,800	65,450
Cirrhina mirgala	80	1,24,800	62,400
Cirrhina reba	17	3,200	7,530
Catla catla	452	4,00,275	35,378
Rita rita	40	20,800	20,800

Determination of the reproductive powers is not only useful from a theoretical point of view but it is of immense importance in the practical question of fish culture. The extraordinary fecundity of fish is remarkable, though it varies in different species, and this fact if properly considered by the pisciculturist, will lead him to devise means to increase the production of fish by protecting the eggs as well as by shielding the young and helpless fry from the many dangers which threaten them.

In the "Natural History of British Fishes" by Buckland many instances are given of the number of eggs found in gravid female fish. A few of these selected by Dunsford (1) are given here for comparison with the Punjab Fish.

Species of fish.	Weight.	Number of eggs.	Number of eggs per lb.
	lbs.		
Carp	14½	6,33,350	43,679
Carp	21½	13,10,750	60,965
Carp	16½	20,59,750	1,24,833
Pike	35	43,000	1,228
Pike	24	2,24,640	9,360
Cod	20	48,72,000	2,43,600
Trout	1	1,000	1,000

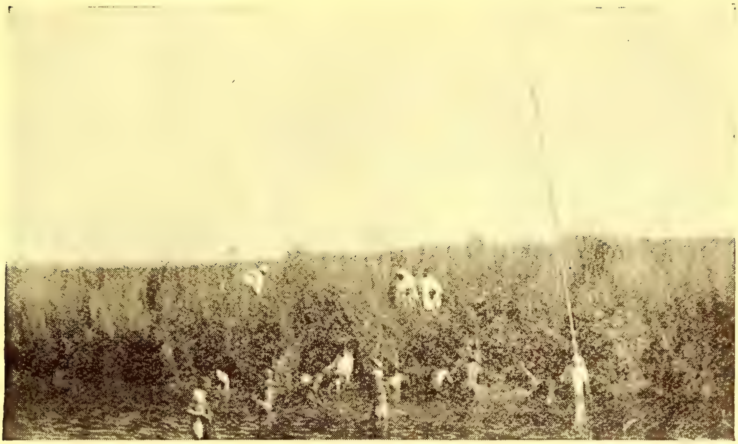
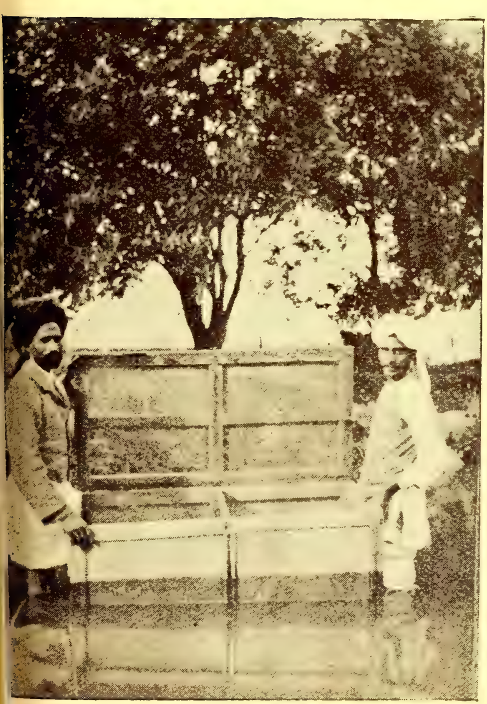


Fig. 1. NETTING FOR MURRAL.



g. 2. Live Car for keeping Eggs and Fry under observation at Hatcheries.

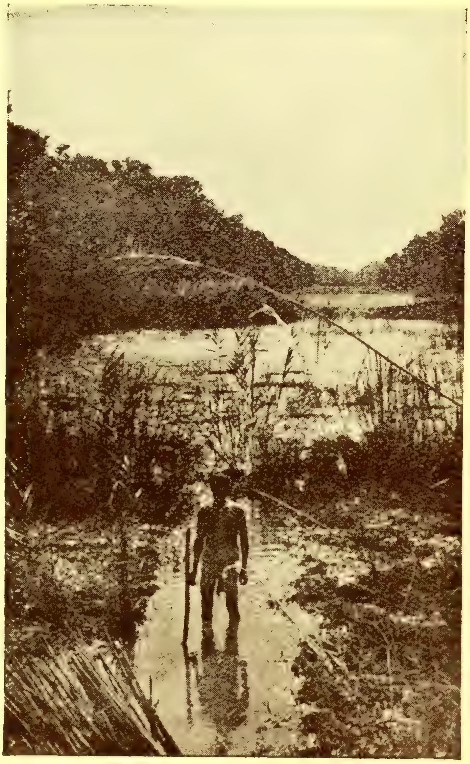
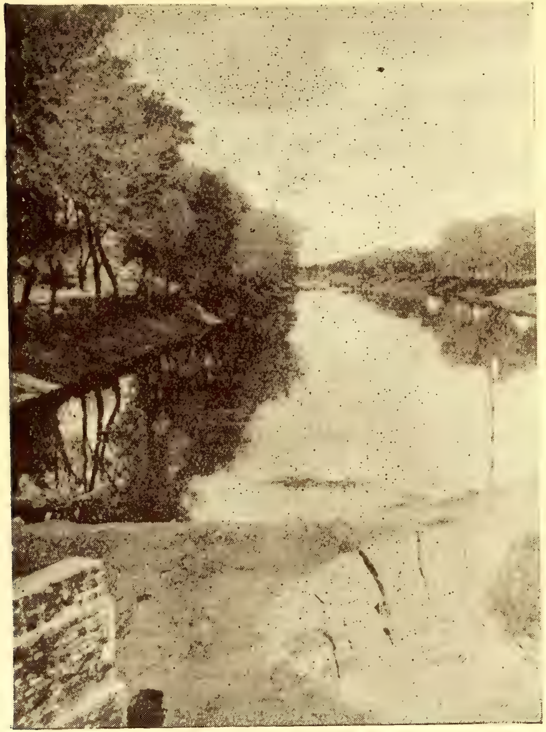


Fig. 3. Tank at Sirkian for Murral (*Ophio cephalidæ*) breeding.



CHHENAWAN FARM FOR CARP BREEDING.
1. Stock pond for breeders.

CHHENAWAN FARM FOR CARP BREEDING.
2. Stock pond for young fish.

All attempts to breed the members of the family *Cyprinidæ,* namely, *Labeo rohita, L. calbasu, Cirrhina mirgala* and *Catla catla* in artificial waters have proved failures. Unlike their western species they do not lay their eggs, even when brood fish from the river are introduced into the tanks. The experiment was tried at the Departmental Hatcheries at Madhopur but no result was obtained. One of the main reasons for our failure is the want of knowledge of their-breeding habits in their natural environments.

The fish become ripe in May and both male and female seek shelter under weeds and aquatic plants near banks and are not easily frightened by the approach of intruders. Towards evening, groups of fish may be seen on the surface splashing water and fighting with each other. These are signs of courtship ! And thus they wait for the first shower of rain. If there are no rains at all, or if they are late, the eggs degenerate in the ovaries, leaving a filthy mass. In July as soon as the rains set in, the streams become flooded and the fish move on to shallow waters. If the flood is of a temporary character they fall back into the main channel with the diminishing current without spawning, but if the floods are continuous the fish get into the surrounding fields, play together, lashing the water with their caudal portions. A female is often followed by three or more males, but reverse cases have also been observed. Very rarely are single couples seen. If a mate is separated from its companion or is companionless it has been heard to produce guttral sounds calling the other. This play lasts for only a short time and the female then lays its eggs which are non-floating and the males shed their seminal fluid or milt over or near them. Depth of water in fields where spawning takes place varies from three inches to two feet, and temperature of water ranges from 76° F. to 98° F. Sometimes when the flood subsides earlier, little pools are formed by the depressions and there the eggs are found in heaps.

The eggs are not laid at one place and at the same time, but at intervals during which the fish keeps on moving with its mates along with the current of water. The rivers are flooded first and the fish therein are the first to spawn, while those of the tributaries wait for heavy rains which flood them sufficiently to overflow into the fields where spawning takes place. The breeding time, thus, lasts from the beginning of July to the middle of August.

An egg measures from 1·5 m.m. to 2 m.m. but it swells to 4 m.m. as soon as it falls into the water due to the presence of a mucous like investment which gives it a glassy bead like appearance. The colour varies in different species : reddish in *Labeo rohita,* bluish in *L. calbasu* and *L. gonius,* light red in *C. mirgala,* dirty white in *C. reba* and yellowish in *Wallago attu.* Milt or male fluid is milky white, non-sticky and non-granular. The development is quickened by the warmth of the sun falling directly on the eggs lying in shallow waters and unlike their western species which hatch out toward the 12th or the 16th day, the embryo is seen bursting the eggs after 30 to 40 hours from the time of laying. There is very tiny yolk bag which is absorbed in three or four days. The mouth opens on the third day after hatching for respiration and two days after this, the young fry begin to seek their food in the diminutive pools where they have been left by their parents.

The extraordinary fecundity of these fish which is unparalleled in animal life is attended with enormous waste. The eggs are laid during floods which may carry them to places where their fate becomes uncertain. The male sheds its milt in water and there are very big chances of an egg being left unfertilized. The eggs either sink to the bottom or rest on grass attached by their gelatinous coats and there is every likelihood of the spawning fields drying up before they are hatched. If, however, they are lucky enough to escape all these misfortunes and are hatched in due time and find opportunity to run into a pool or stream, there their enemies do not leave them unmolested. Eggs of *Wallago attu,* a predaceous Siluroid and *Labeo gonius,* were collected from the same spot. They hatched out at about the same time, but after a week the fry of *Labeo gonius* was 7 m.m. long while that of *Wallago attu* 20 m.m. and the latter were chasing the former and devouring them in large numbers; their mouths being big enough to catch two of the *Labeo* at a time. The rate of growth of *Wallago attu* fry is much faster than that of the Carp. In the latter the mouth opens twenty-four hours after hatching for respiration and the gut is completely formed after seventy-two hours. In *Wallago attu* the mouth opens within less than twenty hours and the gut is complete within forty hours after hatching and the fry begin to devour whatever comes in their way.

Even with such a loss and destruction of the eggs and fry the waters would teem with the finny tribe so long as man did not interfere with their normal growth by indiscriminate and untimely slaughter. The killing of one gravid female would mean the destruction of hundreds and thousands of eggs which otherwise under the most unfavourable circumstances would develop to continue their progeny. Observation of close season for fishing during breeding time will help the matter much, while establishment of hatcheries on scientific basis near the spawning grounds will ensure the development of eggs and fry and lessen the chances of their loss and destruction.

Barbus tor (Mahsir) differs from other members of the *Cyprinidæ* in as much as it is migratory in its habits. *Barbus tor* is seen in March and April ascending considerable heights and traversing long distances to get into the hilly tracts for spawning purposes. It has been said that these fish ascend to these hilly streams to find fresh feeding grounds or shallow waters best suited to the puny strength of their fry when hatched, and also that the parent fish drop back with the decreasing water, and therefore cannot return to devour their fry which are completely cut off till the next rainy season. But all this is true in a way regarding every other *Cyprinidæ* which spawn in the plains: therefore what accounts for the migratory habits of *Barbus tor*? In the case of Salmon, Roule (5) remarks " the habits of salmon are largely determined by the amount of oxygen dissolved in water. During the spawning season Salmon need the respiration intensified and therefore select and ascend rivers in which there is satisfactory proportion of oxygen." L. Crosswell commenting on this paper says "Salmon are driven to seek the gravel beds of the upper reaches of rivers, and trout the gravel beds of the lesser tributaries for spawning purposes, not only by their natural thirst for oxygen or their need of it in intensified respiration, but that their desire for the freshly aërated supply of water afforded by downward rushing mountain brooks, streams and rivers is fundamentally associated with the need of oxygen in oval development in and after spawning." He supports his statement with conclusions drawn from Loeb's experiments on artificial parthenogensis, where fertilisation was initiated and development carried to the larval stage by means of cortical cytolysis followed by accelaration of oxidation in unfertilized eggs of molluses and amphibians. Loeb came to the conclusion that the essential effect of the entrance of a spermatazoan into the ovum is also an acceleration of oxidation. Here is, then, the importance of oxygen in relation to the spawning of fish and the development of fry. Rapid flow of water brings volumes of oxygen in the downward rushing streams and *Barbus tor* travels up to get them. These fish were introduced into the ponds at Madhopur, but notwithstanding the submontaneous character of the place, they did not spawn as no rushing currents of water during rains stimulated them to lay their eggs.

In India pisciculture has almost been wholly neglected and in the Punjab it has never been seriously undertaken. The fecundity of fish is an established fact and the truth of this has been recognised in foreign countries where accordingly scientific methods have been devised to carry on fish culture. Study of the breeding habits shows that the Indian Carp can be made to spawn in ponds and tanks provided that all the conditions of their natural spawning grounds are taken into due consideration. A current of running water, flooded area during rains, escape of flood water into adjoining fields will, undoubtedly, result in stimulating the fish to spawn.

Members of the *Ophiocephalidæ* have successfully bred in artificial waters; and they are mainly tank fishes. The enormous production of eggs in *Cyprinidæ* and *Siluridæ* is in adaptation to their environmental conditions which allow hardly one out of thousand eggs to develop, while in *Ophiocephalidæ*, formation of nests, parental care and absence of floods play a great part protecting the small number of eggs—two to seven thousands—which are laid before the rains set in. The observations recorded here were made at the Departmental Hatcheries on *Ophiocephalus marulius* mainly and *O. gachua* and *O. striatus* occasionally.

Nest building of *O. striatus* of Ceylon has been described by Willey (6), and of *O. striatus* of Mysore by Day (9) and of *O. punctatus* of Madras by Wilson. *Ophiocephalus marulius* makes its nest amongst aquatic plants and in spots where there is abundance of food for young fry. Just before the eggs are laid the fish may be seen swimming towards the banks and hiding themselves under vegetation: they are seen in pairs. A pair is often seen to frequent only one place, where later on the nest is made by means of cut portions of weeds which the fish break or uproot with their mouths. It takes at least a week to build up a nest: which is merely a receptacle for the eggs without any elaborate passages for ingress or egress of fish; and both male and female take part in its construction.

Process of spawning has been observed in *Ophiocephalus gachua*. The pair lies submerged in clear, but stagnant, water without any nest or receptacle. The female has its ventral surface directed upwards, while male lies crosswise over it. Their genital pores are thus close together. Two to three hundred eggs are liberated at a time at an intervals of a minute or two, and the fish remain in the same position, and at the same place till all the eggs have come out. The male pours its milt at the same time. Eggs rise to the surface, spread there and float. The fish use their fins all the time to keep their balance.

Eggs in *Ophiocephalus marulius* are floating, circular, light, reddish yellow and non-adhesive. There is a single large oil globule in the yolk which makes the egg bouyant. Each egg measures 2 mm. There is no gelatinous covering. The embryonic development goes on rapidly, but depends considerably on the temperature of water. The eggs hatched out in fifty four hours at temperature 61° to 79° F and in thirty hours where the temperature ranged from 83° to 92° F.

The breeding season of *Ophiocephalidæ* in the Punjab lasts from the middle of April to the end of July. The fish guard their fry for about a month or so. In the case of *O. marulius* six weeks old fry do not keep together and probably when the fish find its young ones have become disobedient and have begun to wander about, it begins to devour them.

Whether it is the male or female that guards the nest is an open question. The female has been frequently seen just beneath the eggs and fry, keeping strict guard over them and is easily recognised by its large size. The male keeps watch at a short distance, and whenever the nest is approached, the male runs away causing a splashing noise which warns the female. The female does not run away immediately but keeps looking at the intruder and withdraws herself backwards slowly, keeping an eye on the nest at the same time. The positions of male and female are very often reversed. For full one week the fry remain in the nest, and then the parent fishes take them along with them. The fry sometimes separate into several groups, but the parents stay at one place and each group comes back as though they have been ordered to do so. In one instance the parent fish jumped a foot clear out of water after a kingfisher, which after taking a fry had flown to a branch of a tree a yard above the surface of water. When the fry grow big and are too numerous to be guarded by the mother alone, they split up into two groups, one guarded by the male and the other by the female. The fish at this stage when approached would either hide itself under its young ones or would leave them very reluctantly, going not far off, and returning soon after the intruder had gone away. A pair of *Ophiocephalus gachua* were once seen in a pond with a few days old fry. The male swam immediately below the swarm while the female was at a little distance off. Positions were, however, frequently reversed, and the female as often remained below while the male kept watch on one side or the other, swimming round and round. Two *Belone cancilla* made their appearance, evidently attracted by the fry, but were met with by the angry eye of the mother. Both intruders came to a halt and remained as motionless as *O. gachua*, and a staring match ensued : both being absolutely motionless for the space of quite a minute or more, though not nine inches of water divided them. At length a very slight fin movement of *O. gachua* sent her slightly forward and like a flash both the *Belone cancilla* turned about and made off, while *O. gachua* returned to her brood. Both the *Belone cancilla* were considerably longer than the *O. gachua* which sent them about their business.

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A DESCRIPTION OF THE NESTS AND EGGS OF THE COMMON BIRDS OCCURRING IN THE PLAINS OF THE UNITED PROVINCES.

BY

E. H. N. Gill.

Part IV.

(*With a plate*).

(*Continued from page* 768 *of this volume.*)

Motacilla maderaspatensis (831) ..	The Large Pied Wagtail.
Local name	Bhuin Mamula.
Anglo-Indian name	The Common Wagtail.

This is a familiar bird in the well-watered tracts of the western districts, and of all the numerous species visiting us in the winter is the only one which remains behind to breed. I have never seen the birds East of Benares, and I very much doubt whether they occur in the Eastern Districts at all.

On the Ganges and Jumna, and various other streams and swamps in the Western Districts the birds are common, and are met with either singly or in pairs in the immediate neighbourhood of water, from the surface and by the side of which they procure their sustenance. They are resident throughout their range practically all the year round, and are seldom absent from the vicinity of their breeding grounds.

The period of nidification is from about March to May—quite a short one. Both birds assist in building the nest, and if watched carefully will soon lead one to the selected spot. The sites chosen for these nurseries are influenced to a great extent by environment, so that in the Bundelkhand streams, those with rocky bottoms, the nests are invariably placed in holes and crevices in rocks quite close to the water; whereas on the Jumna and Ganges the most favoured sites are pontoon bridges, the nests being carefully tucked away in some nook or corner of an old boat or iron pontoon, in which circumstances the birds evince no fear of man whatsover. On tanks and marshes old disused boats are often appropriated, the nests being hidden away under the gunwales; while holes in the walls or drain pipes of old buildings in the vicinity are also favoured. In the Jhansi district there is a weir across the Dassan river which contains an arcade of considerable length. Inside this arcade little alcoves have been let into the wall at frequent intervals, and on one occasion I found about a dozen nests in these alcoves all of which contained eggs. It will therefore be seen that the building sites selected by these birds are by no means limited, and not confined to any particular locality; and, as Hume puts it, "It is impossible to generalise satisfactorily in regard to the nidification of such irregularly-minded birds as these".

The nest varies in size and structure in accordance with the position in which it is placed. The choice of building material is also unlimited—fine twigs, grass-stems, wool, old rags, hair and tow, and various coarse vegetable fibres being freely used; and while some nests are frail and delapidated with only a slight depression in the centre to contain the eggs, others are strong and substantial with a well-formed and deeply cup-shaped egg-cavity in the middle, neatly lined with horse-hair and soft vegetable fibres.

The normal number of eggs is four, occasionally five, and often only three. In shape they vary considerably, but are typically moderately long ovals more or less pointed towards the small end. In regard to colouring they are, as a whole, of two distinct types. In one the ground-colour is a greenish white with markings of slightly darker shades, and in the other a dull white with dingy brown markings; and between these two types intermediate varieties varying in tone and character of the markings occur quite commonly. The markings consist of spots, specks, clouds and smudges, in some more some less, some times bold and distinct and sometimes so confluent as to almost obscure the ground-colour altogether. In fact the variation is so considerable that a reliable description is almost impossible. A normal specimen would measure about 0·9 by 0·6 inch.

Alauda gulgula (861)	The Indian Sky-Lark.
Local name	Bhurut.
Anglo-Indian name	The Sky-Lark.

This bird seems to be pretty evenly distributed throughout the alluvial tracts of the Province, and is at once recognised by its pleasing song uttered while on the wing. It is met with either singly or in pairs, and seems to prefer wild open country; usually avoiding anything in the nature of heavy grass or forest.

The breeding season seems to be from about April to the end of June, but the birds, being terrestrial in their habits, are wary and suspicious; with the result that the nests are, as a rule, rather difficult of location; and on account of the remarkably protective nature of their colouring, the birds are capable of seeing without being seen; a fact which renders careful observation somewhat difficult.

Broken country interspersed with stubble, patches of stunted tamarisk and camel-thorn, with perhaps a stunted acacia here and there, are ideal nesting places; but even though the birds may be seen to frequent particular spots the nests will not be revealed till after diligent search, and very often not at all.

If the birds are busy constructing a nest they will always be on the lookout for intruders. Consequently the observer, though he may have concealed himself at a respectful distance, has probably made his presence known long before he got there. He wonders then how it is that he is unable to detect the position of the nest. He sees a bird descend at a certain spot with building material in its bill, he watches it leave the same spot with its bill empty, and yet a careful search reveals no nest. He returns to his observation post and again watches the same farce enacted; perhaps in the same spot, perhaps in several others. But this does not bring him any nearer the nest, nor afford the smallest clue to its whereabouts. Eventually he gives the business a miss in baulk, and goes away thoroughly disgusted;—a sadder but not a wiser man.

What actually happens is this. Though the birds may be quite aware of the presence of a stranger, his mere presence, provided he is not too close, is not sufficient to deter them from the more important work of reproduction. Consequently building operations are continued in the usual way; but with fiendish persistence the birds contrive to put the watcher off the scent by descending with building materials quite near the latter, but at some distance from the nest. Then, watching their opportunity and taking advantage of every conceivable bit of cover, they worm their way to the nest, and, after fixing the material in the desired position, worm their way back to the position from which they started before flying off again.

Practically the same procedure is adopted when the eggs are laid and incubation is in progress. The sitting bird will leave the nest on the approach of a stranger if it can possibly do so without being detected, and will travel some distance along the ground before rising into the air. But if caught napping—not a common occurrence—it will sit tight and trust to its colouring to escape observation. In these circumstances it is often flushed, and the nest is then revealed. Ordinarily the nests are found purely by accident, but the majority escape detection altogether.

The nest is always placed on the ground in a hollow scraped up by the birds themselves, sometimes under a stone or clod of earth, sometimes under or at the roots of tufts of grass, and sometimes at the base of some stunted bush. Sometimes it is a deep and sometimes a shallow cup, built into the hollow with the rim only slightly protruding above, and composed of fine grasses, roots, and stems with the egg-cavity carefully lined with much finer material; and both birds assist in its construction.

Five is the full complement of eggs laid, but it is more usual to find three occasionally four. In shape they are typically moderately elongated ovals, sometimes a good deal pointed towards one end. The ground-colour varies from a greyish to a yellowish white with a moderate gloss; rather densely freckled, spotted and speckled, sometimes blotched, with various shades of dingy yellow and pale purple. Some specimens are almost inseparable from those of the Common Sparrow, and a normal egg would measure about 0·8 by 0·6 inch.

Alaudula raytal (866) .. .. The Ganges Sand-Lark.
Local name .. .. .. Unknown.
Anglo-Indian name .. .. Unknown.

This inconspicuous though sprightly bird is commonly distributed throughout the Eastern and Western districts alike, but seems to be confined almost exclusively to the undulating sandy dunes of the Ganges and other large streams. Its habits are the same as those of the other allied species, save that it is not much of a songster, and is perhaps even more terrestrial than the last species. Straggling patches of tamarisk, camel-thorn, and other deep-rooted fungi, common along most sandy dunes, are favourite nesting places; but here again the protective colouring of the birds renders the detection of their nests very difficult.

The breeding season is from about March to May, and the nests, though similar in structure to those of the last species, are much smaller; being about three inches across and placed, as a rule, at the roots of tamarisk and camel-thorn bushes, or under tufts of grass; grass-stems, roots, and dry tamarisk leaflets being freely used in the structure.

The full complement of eggs is three, though normally only two are laid. In shape they are typically rather perfect ovals, slightly compressed towards one end. The ground-colour is a yellowish or greyish white with a moderate gloss. The markings are peculiar and characteristic and consist of a mass of minute speckles of a slightly darker shade scattered profusely all over the egg, and only very occasionally presenting secondary markings of pale purple shades. A normal egg would measure about 0·7 by 0·5 inch.

Mirafra cantillans (869) .. .. The Singing Bush-Lark.
Local name .. .. .. Aghun, Aghin.
Anglo-Indian name .. .. Unknown.

This species seems to be locally distributed in some portions of the Province, and is totally absent from others. In habits and coloration it greatly resembles the Red-winged Bush-Lark, but its song is unmistakable. The two species are, however, much confused by the amateur.

The birds are found in wild bushy country, and several pairs may be seen frequenting the same locality, flitting about the bushes to the accompaniment of those quaint plaintive notes so characteristic of the species.

The breeding season is from about March to August, and the nests, invariably placed on the ground amidst thick grass and well concealed, are of two distinct types—a peculiarity for which there is no accounting. One is just the typical lark's nest as already described, and the other is more or less dome-shaped with the eggs completely concealed from view. It is composed of dry grasses and roots and is, in fact, a perfect miniature of a Coucal's.

Four appears to be the full complement of eggs, though three is more usual. In shape they vary a good deal, but are typically rather long ovals, somewhat pointed towards one end. In colouring and character of the markings they resemble certain types of Sparrow's eggs, but in some specimens the markings present a reddish brown tint by which they can be differentiated. A normal egg would measure about 0·7 by 0·5 inch.

Mirafra erythroptera (871).. .. The Red-winged Bush-Lark.
Local name .. .. .. Jungli aggia.
Anglo-Indian name .. .. Unknown.

This is the common Bush-Lark of the Province, and is met with in most suitable localities. Its habits and particulars of nidification are identical with those of the last species, even to the extent of constructing two different kinds of nests. The eggs, however, are remarkable for the uniform speckly character of the markings, and the distinct red and reddish brown tints which predominate in all the eggs, and which, in many cases, have a tendency to collect in an irregular cap or zone at the large end. The eggs approximate in size to those of the last species.

Galerita deva (875) .. .. .. Sykes's Crested Lark.
Local name .. .. .. Chandul.
Anglo-Indian name .. .. The Crested Lark.

This species occurs quite commonly in suitable localities throughout the Province, particularly in the drier and cultivated tracts. Their pale colouring and small perky crests are unmistakeable, but they do not seem to have acquired the soaring habit of the Indian Sky-Lark. They are, however, adepts at evading observation themselves and leading intending robbers away from their nests, and invariably evince the same cunning as the Indian Sky-Lark.

The period of nidification is from about June to August, and the nest is always placed on the ground in dry and open country. It is invariably built into a small hollow or depression sometimes almost entirely concealed by some clod of earth, or hidden away amidst a tussock of grass, or at the roots of some stunted bush. It is composed of various grasses and vegetable fibres usually without any lining whatsoever; measuring about 4 inches in diameter and 2½ inches in height.

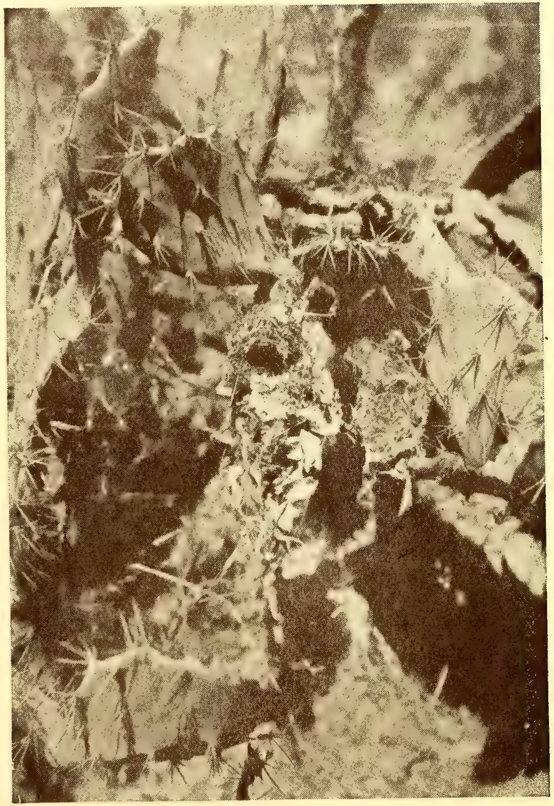
The eggs, usually three in number, vary considerably in shape, size and coloration; but typically are broad ovals, slightly pointed towards one end. The ground-colour varies from a dull yellow to a greenish white and exhibits a brighter gloss than any of the other species. The markings consist sometimes of a multitudinous collection of freckles of purple shades, and sometimes of spots and freckles of reddish brown underlaid by pale purple clouds particularly towards the large end; some eggs bearing a remarkable resemblance to those of the Brown-backed Indian Robin. A normal egg would measure about 0·7 by 0·6 inch.

Pyrrhulauda grisea (879) .. .. The Ashy-crowned Finch-Lark.
Local name .. .. .. Diyora, Duri.
Anglo-Indian name .. .. The Black-bellied Lark.

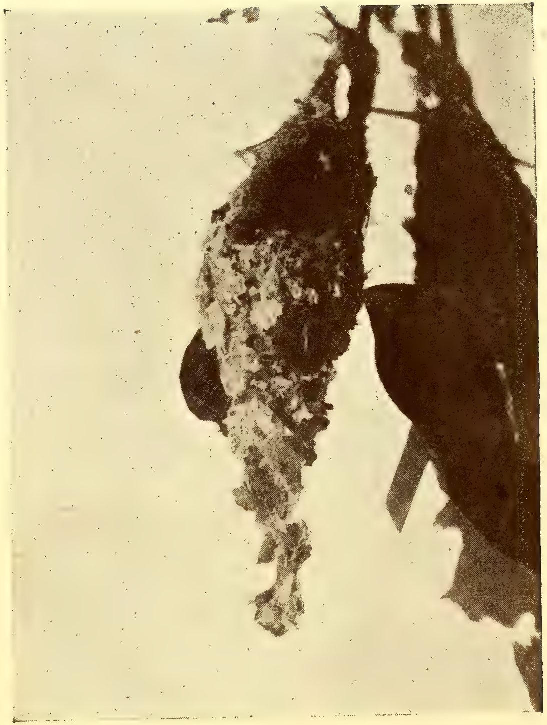
This is perhaps the commonest species in the Province, and occurs in almost every district in suitable localities. The birds seem to be more or less gregarious in their habits and are usually met with in parties of a dozen or more, frequenting dry open plains and undulating uplands. Their colouring is of a highly protective nature with the result that they will usually allow one to approach to within a few feet without being alarmed. They are much the smallest of the species already described, and the males can easily be recognised by their black underparts and the light grey patches on their heads.

The males of this species evince a curious habit of soaring into the air at frequent intervals, rising and falling in rapid undulations, and then descending to earth in a fast nose dive, sometimes from considerable heights. This curious practice is more pronounced in the breeding season and has doubtless something to do with it, though to the casual observer it would appear to have no meaning whatsoever.

The period of nidification is from about July to August, according to locality, though I am unable to state definitely whether two broods are raised in this



NEST OF THE PURPLE SUN-BIRD IN A CACTUS BUSH.



NEST OF THE PURPLE SUN-BIRD (*Arachnechthra asiatica*).

period or not. The work of nest construction would appear in most cases to be undertaken entirely by the female, though the male doubtless assists in incubating the eggs and feeding the young. Nests may be found quite commonly on the ground on dry open plains or fallow fields ; a hoof-print frequently forming the cavity in which the nest is placed. Sometimes the nest is placed against a clod of earth, sometimes against the slender roots of camel-thorn, but is mostly right out in the open without covering or canopy of any description. The nest itself is merely a small, circular, more or less cup-shaped pad of various vegetable fibres and soft materials, about 3 inches in diameter and quite substantial. But on more than one occasion I have found eggs on the bare ground where there was not any sign of a nest, while Hume records having found a nest amongst the ballast, between the rails, where trains were passing a dozen times a day over the sitting bird ; and " When we think of the terrific heat glowing from the bottom of the engine, the perpetual dusting out of red hot cinders, it seem marvellous how the bird could have maintained her position".

The full complement of eggs is three, though one ordinarily finds only two. In shape they are typically moderately elongated ovals somewhat pointed towards one end. The ground-colour varies from a greyish to a greenish white, and the markings consist of speckles, spots, and mottlings of yellowish brown scattered over the egg. Some are remarkable for their freckled character, while in others the markings are hazy and indistinct, and yet so uniform and confluent in others as to obscure the ground-colour almost entirely. A normal specimen would measure about 0·72 by 0·55 inch.

Arachnechthra asiatica (895) .. The Purple Sun-bird.
Local name .. .. .. Shakar khora.
Anglo-Indian name .. .. The Common Honey-Sucker.

The Purple Sun-bird, so often referred to as a Honey-Sucker, is very commonly distributed throughout the Province. It is a familiar and fascinating garden species, and is always seen frequenting certain flowering trees and shrubs from the blooms of which they extract the nectar ; fluttering and hovering about the blooms like gigantic honey-bees.

The male is unmistakeable on account of his brilliant peacock-blue plumage, but the female is not nearly so conspicuous. Her colouring is, in fact, distinctly sober ; so that the uninitiated might quite easily pass her by, or perhaps not identify her in any away with her sprightly and gaily-coloured mate.

The period of nidification seems to be quite an elastic one, for nests may be found, according to locality, in almost any month of the year. February and March, however, would seem to be the most favoured. The labours of nest construction, incubation of the eggs, and feeding of the young, are borne entirely by the female, while her retrograde mate disports himself gaily among the flowers, makes himself most objectionable to all feathered society in the neighbourhood, occasionally sitting near the nest and cheering his mate with loud and vigorous song, and is not above carrying on an outrageous flirtation with the wife of another elaborately-garbed gentlemen in the next hybiscus patch if she so happen to pay him a visit within the limits of what he considers to be his boundaries. But where the reproductive faculty seems to have passed him by, it is certainly an overmastering desire with the female, who devotes herself to her arduous labours with a persistence beyond all praise. Not only does she evince a sense of ingenuity truly remarkable in the matter of architecture, but her eye for the picturesque is equalled only by her choice of protective environment, her unbounded devotion to the young, and the quixotic departures from the normal in the choice of peculiar nesting sites.

The nest is pensile and of very remarkable structure, conforming to a shape which I can best liken to an elongated pear ; the lower part, comprising the egg-compartment, being almost a perfect cup with the sides tapering gradually upwards to meet at the point of suspension. The choice of materials is practically unlimited, for anything soft and pliable, which can be woven with spider's web and silky materials into a compact nursery about 7 inches in height and 3 inches in width, is used for the purpose, and a perfect work of art is the result.

About midway between the point of suspension and the egg-compartment a small circular hole about an inch in diameter is worked into the nest fabric which operates as an entrance to the nest, and over which is worked a small canopy or portico, which is a characteristic feature of the construction.

From the point of suspension the nest is gradually extended and widened till the place where the aperture should be is reached; the nest having acquired, by this time the shape of a more or less solid cone with the apex on top. Now comes the aperture with the little projecting cornice above it, and the greatest care is exercised in its construction. Follows later the extension of the body of the nest, and finally the soft and cosy egg-compartment. Then follows a short period of activity during which the female may be seen going in and out of the nest, twisting and turning her little body about inside it in order to get the pliable materials to conform to the shape of her body; and, as she sits in the nest with her bill protruding from the aperture, it acquires a distinct bulge behind in order to accommodate her tail in comfort. This little habitation is completed in about ten days. Her food during the priod of nidification is reduced absolutely to the minimum, for she is seldom away from the nest, and is not attended to at all by her mate.

Rather a remarkable feature of these nests is the dry leaves and rubbish which are stuck all round the egg-compartment, and also as streamers below it; which Hume and other observers ascribe purely to ornamentation. But I would suggest that a much subtler motive is intended. It is a curious fact (I speak purely from personal observations) that nests which are built in what one might consider abnormal positions—on punkah ropes or the wire netting across a window for instance do not ordinarily exhibit these untidy streamers to any appreciable extent. But those built in thorn and cactus bushes where rubbish and cobwebs abound are most elaborately decorated with these materials in order, presumably, to harmonise with the surroundings as much as possible. Protective mimicry or camouflage would therefore be quite a possible factor when comtemplating the question of what others have been content to treat as mere ornamentations. I should imagine that the struggle for existence amongst these smaller species is sufficiently acute to preclude any idea of ornamentation where a more useful purpose might be served. Concealment and mimicry would ordinarily be the prime consideration.

Normally two eggs are laid, but one frequently finds three. In shape, size and colouring they vary considerably; but typically are moderately broad ovals, considerably pointed towards one end. The ground-colour varies from a greyish, through shades of greenish, to a brownish white. The markings consist principally of minute speckles of grey, pale purple, and brown shades pretty uniformly scattered over the whole egg, usually obscuring the ground-colour altogether, and invariably collecting in a confluent zone at the large end. The dull, ill defined and confluent nature of the markings is a characteristic feature of the eggs, and, in fact, quite unmistakeable. A normal egg would measure about 0·65 by 0·45 inch.

Dicaeum erythrorhynchus (919) ..	Tickell's Flower-Pecker.
Local name	Unknown.
Anglo-Indian name	The White Honey-Sucker.

This little bird is commoner than is usually supposed. It is to be found in most districts in the Province, but on account of its inconspicuous colouring and small size quite easily escapes observation. In general appearance it is very like the female of the Purple Sun-Bird, though it is smaller, the bill much shorter, and the upper plumage suffused with a greenish tint. There is no mistaking the difference when the two species are seen together.

Though of such small size, they differ from the Purple Sun-Bird in one important particular in that they are seldom seen among bushes or shrubbery, but always on large trees for which they evince a curious attachment. They are met with either singly or in pairs, flitting nervously about the highest branches and are everlastingly on the move. Their very faint but high-pitched note repeated at intervals, is unmistakeable.

The breeding season is from about February to May, and the nest, always placed high up on some large tree, is one of the most difficult to find. The birds are extraordinarily wary, and I have seen several cases where they have deserted the nest altogether on account of the observers being careless and arousing their suspicions. Both birds assist in building the nest, and the male probably assists in incubating the eggs as well.

A considerable amount of attention is paid to concealment, so that the nest is invariably hidden away amongst a bunch of leaves. It is pensile, and in appearance is not unlike the Purple Sun-Bird's, save that it is much smaller, usually much rounder, and more carefully put together. The building materials are much finer, and the egg-compartment is most carefully lined with soft vegetable fibres and silky down, particularly silk-cotton from the pods of *Bombax malabaricum.* The external decorations and streamers of rubbish, as also the projection over the aperture, are almost entirely wanting.

Only two eggs are laid. In shape they are typically rather elongated ovals, more or less pointed towards the small end. The ground-colour is pure white and glossless without any markings of any description. A normal egg would measure about 0·6 by 0·4 inch.

Piprisona squalidum (921) ..	The Thick-billed Flower-Pecker.
Local name	Unknown.
Anglo-Indian name	Bul-tit.

This interesting little bird occurs quite commonly in almost every district in the Province, and, like Tickell's Flower-Pecker, evinces a curious liking for large trees ; seldom or ever frequenting bushes or shrubbery. In size and colouring it resembles greatly Tickell's Flower-Pecker, but its note is quite different and characteristic ; being a succession of loud *tics* uttered both whilst feeding and during flight. The bill too is much shorter, and when looked at from above forms a complete equilateral triangle. The birds are met with either singly or in pairs, and are everlastingly on the move ; never resting for a single moment.

The breeding season is from about February to June, though the bulk seem to breed in March, and the nest is so typical that when once seen it can never be mistaken for any other. They are always placed on large trees, sometimes low down, but invariably at considerable heights from the ground ; and a great deal of importance is attached to concealment.

The nest is composed throughout of extremely soft and pliable vegetable fibres of a reddish brown shade, particularly the silkly down from the young shoots and flowers of various plants which are woven together in such a manner as to represent felt. It is small, pendant, and purse-shaped and slung along a twig or bough which forms the roof of the structure ; and not suspended from a point like the Purple Sun-Bird's or Tickell's Flower-Pecker's. The aperture is somewhat elongated and about an inch in length, with its major axis on the same plane as the twig and immediately below it. Measured from top to bottom the nest would be about 3½ inches, and the egg-compartment about 2 inches across. The side walls are hardly a eighth of an inch in thickness, but the baggy lower portion thickens perceptably to about half an inch The curious felt-like fabric and reddish brown colour are, however, unmistakeable.

Quite a number of nests are built amongst the leaf nests of a particularly vicious species of red ant in which circumstances they seem to escape molestation altogether. Not only does the colour of the decaying leaves bend perfectly with that of the nest, but the ants when disturbed become so aggressive as to cause the intending robber to beat an ignominious retreat.

Normally two eggs are laid, but three is of quite common occurrence. In shape and size they vary a good deal, but typically are rather elongated ovals. The ground-colour varies from a light pink to a distinct rosy red usually thickly spotted and speckled with brownish pink and claret-colour, particularly towards the large end where they have a tendency to form an irregular zone or cap. A normal egg would measure about 0·6 by 0·4 inch.

(*To be continued*).

NOTES ON INDIAN BUTTERFLIES.

BY

Lt.-Col. W. H. Evans, D.S.O., R.E., F.Z.S., F.E.S.

(*Continued from Vol. XXVIII, p.* 40.)

40. The following additions and corrections are needed to the papers appearing in the Journal on "Butterfly collecting in India" and the "Identification of Indian Butterflies."

(*a*) Vol. XXVIII, p. 502 and 747. *Morphids=Amathusiidæ* as far as India is concerned. True Morphids are S. American.

(*b*) Vol. XXIX, p. 231. Under A.1. *Troides* alter 1a to 1b in the 1st and 7th lines: alter 1b to 1a in the 1st and last lines: put 1a, *st seq.* before 1b, *et seq.*

(*c*) Vol. XXIX, p. 242. Plate VI, bottom left hand figure, alter A. 12.1 to A. 11.1.

(*d*) Vol. XXIX, p. 250: B. 6.1. In the B.M. there are 2 ♂ 1 ♀ of *Delias singhapura, Wall,* from Tavoy. It differs from *agoranis* in having black veins on the hindwing below. Whether *agostina, agoranis* and *singhapura* are conspecific is uncertain, but I prefer to regard them as such for the present, though the first two have been caught flying together by Mr. G. R. E. Cooper. The races under B. 6.1 should stand thus:

α. *singhapura agostina, M.* Sikkim-Dawnas.
β. *singhapura agoranis, Grs.* Dawnas.
γ. *singhapura singhapura, Wall.* Dawnas—S. Burma.

(*e*) Vol. XXIX, p. 253. Mr. H. T. G. Watkins investigated the *albina-paulina—libythea* group of *Appias* on my behalf in the B.M. last summer. It was found that *zelmira* had been described from the Coromandel Coast and its place must be taken by *olferna, Swin.*: *swinhoei, M.* and *ares, Swin.* (not in my list) also=*libythea*. It may be remarked that, though the extreme dry season male of *libythea* superficially resembles *albina,* it may always be separated easily since there is only one tuft of hairs near the end of the abdomen, instead of two. *venusta* proves to be a *paulina* form and *flava* must be employed for the Ceylon race of *albina*. In Ceylon there are three female forms of *albina, viz., flava* yellow above and below: *semiflava* white above, yellow below: the common form, white above and below, for which I propose the name *norma, nov*: *semiflava* is Fruhstorfer's name, not Rober's. *melania* is a distinct Australian species and *paulina* should be substituted as the species name. *paulina* was described from the Coromandel Coast, Java and Tranquebar, while the figure accompanying the description represents a female, which might well appertain to the Javan or Ceylon form, but not to the S. Indian: therefore typical *paulina* should be regarded as Javan and *galene, Fd.,* employed for the Ceylon race. The names should stand thus:

B. 10.4. *libythea libythea, F.* Ceylon, India.
libythea olferna, Swin. Bengal-Assam-Burma.
B. 10.6. *albina flava, Röb.* Ceylon.
♀ *v. semiflava, Fruh.*
♀ *v. norma, Evans.*
albina darada, Fd. S. India. Sikkim-Burma.
♀ *v. semiflava, Fruh.*

B. 10.7. *paulina galene, Fd.* Ceylon.
♀ v. lankapura, M.
paulina wardii, M. S. India.
paulina adamsoni, M. Burma.
paulina galathea, Fd. Andamans, Nicobars.

(*f*) Vol. XXIX. p. 254. The Indian Empire forms of *pyranthe* and *florella* are ;
B. 11.4. *pyranthe minna, Herbst.*
B. 11.5. *florella gnoma, F.*

(*g*) Vol. XXIX, p. 255. The Burmese race of *verhueli* is not by any means the same as the Malayan *gobrias* and I propose the name *parva, nov.*
B. 13·1 *β. verhueli parva,* Evans.

(*h*) Vol. XXIX, p. 255. Mr. H. T. G. Watkins has pointed out some errors in the genus *Gonepteryx* : the correct names are:
B. 14. 2. *farinosa chitralensis, M.*
B. 14. 3. *α. aspasia zaneka, M.*

β. aspasia zanekoides, De N.

41. The following butterflies were obtained by Major F. M. Bailey in August 1916 on the Safed Koh beyond Parachinar and in nearly every case the record extends the previously known range of the butterfly :—

Parnassius delphius kafir, Avin. At 13,500 feet.
Pieris callidice kalora, M.
Pieris canidia, Sparr.
Aporia leucodice balucha, M.
Pararge schakra, Koll.
Maniola pulchra, Fd.
Karanasa hubneri, Fd.
Aulocera padma, Koll.
Aulocera swaha kurrama, Evans.
Vanessa urticæ rizana, M.
Vanessa cashmirensis, Koll.
Argynnis kamala, M.
Argynnis adippe jainadeva, M.
Argynnis lathonia issœa, Db.
Zizera maha, Koll.
Polymmatus eros drunela, Swin.
Heodes phlaeas stygianus, But.
Thecla syla, Kollar.
Hesperia alpina, Ersch.

42. The following are new butterflies from Thibet :—

(*a*) *Erebia phyllis irma, nov.* ♂ above very dark brown : upf. with the usual area of modified scales on the disc and a large pre-apical black ocellus containing 2 prominent white pupils. ♀ paler brown, the area between the end of the cell and the ocellus tawny, continued under and outside the ocellus. Unf. tawny with ashy borders, ocellus as above, but with pale ashy ring. Unh. mottled brown and white, a very obscure discal and a submarginal irregular black line, between which is a row of obscure small white spots. Expanse 49 mm. Differs from all other forms of *phyllis, Leech,* in the ♂ having no fulvous colour above and in the ♀ having no yellow ring to the ocellus. S. E. Thibet, between Bhutan and Gyantse, 13,000 feet, August 1922 ; 2 ♂, 3 ♀ caught by Major F. M. Bailey : types in B. M.

(*b*) Colias *cocandica irma, nov.* This name is proposed for the *Colias* figured by me on the plate opposite page 540, vol. XIII, as *cocandica.* It differs four *cocandica, Ersch,* chiefly in size, 54 mm. against 42 mm. The type is in the B. M.

(*c*) *Colias pugo, nov.* Above ♂ pale yellowish white, ♀ white, veins black dusted, costa forewing red, cilia white. Upf. base black dusted, a black spot end cell: marginal black border broad, one-third of wing, with a central row of large white spots, each of which is joined to the termen by a white line. Uph. basal ⅔ black, a white spot end cell: border broadly white, divided by black dusted veins. Below costa F and H red. Unf. white, a black ring end cell, apex yellowish green, obscure discal black spots. Unh. greenish yellow, basal ⅔ black dusted, white spot end cell; margin broadly pale, with dark dusting on either side of the veins. Antennæ and legs red. Expanse 48-50 mm. Much paler than any known form of *cocandica, Ersch,* and with larger marginal spots. Smaller than *irma, Evans,* which has red cilia: not nearly as dark as *nebulosa, Ob.*: differs from *thibetana, Riley,* in having the costa red. Nearest of all to *thrasibulus, Fruh,* as regards markings, but that species is yellow above. This species was recorded by Mr. R. South in B. N. H. S. Journal, vol. XXII, p. 153, as *Colias nastes, Bdv.,* having been obtained by Major F. M. Bailey at Pugo, S. E. Thibet, 14,000 on June 27th, 1911: 3 ♂ 1 ♀ were obtained and the types are in the B. M.

(*d*) *Colias montium longto, nov.* ♀ above yellowish white, mostly dusted over with black scales. Antennæ, legs, costas and cilia red. Upf. veins prominently black, pale centred black spot end cell: margin broadly black, bearing large pale spots in 1, 2, 4 and 5. Uph. entirely black dusted, a large white spot end cell: large ill defined, black dusted, submarginal pale spots. Unf. white, dusted black scales, complete series discal black spots: white centred spot end cell, apex yellowish green, black dusted. Unh. entirely yellowish green, dusted black scales, red ringed white spot end cell, with an external red tongue and a red streak between base wing and base cell: obscure discal black spots. Expanse 48 mm. Resembles *montium, Ob.,* which occurs in S. E. Thibet, but *longto* is paler with more black dusting, resembling somewhat *cocandica, Ersch.* 1 ♀, the type in B. M. obtained by Major F. M. Bailey on August 8th, 1922, in Thibet between Bhutan and Gyantse.

(*e*) *Lycaena orion tytleri, nov.* Above rather as typical *orion, Pall,* but much darker, smaller and wings more pointed: no traces of the usual pale submarginal markings. Below marked as in *orion,* the ground colour duller and the orange submarginal markings in consequence much less prominent. Expanse 28-30 mm. obtained by Major-General H. C. Tytler's collector at Gyantse in May 1911. Type ♂ and ♀ in B. M.

A JOURNEY TO SIAM AND BACK.

BY

MAJOR C. H. STOCKLEY, D.S.O.

PART IV.

(*With 2 plates.*)

(*Continued from page 722 of this Volume.*)

I left Hkambengpet on March 26th and did an uninteresting ten mile march to Nam Me Kam, a little N. of W. Very hot and mostly through dry deciduous jungle. The march was only marked by my attempts to secure a Green Imperial Pigeon, which flew from tree to tree; invariably flying out of the wrong side and also selecting the tallest trees on which to settle.

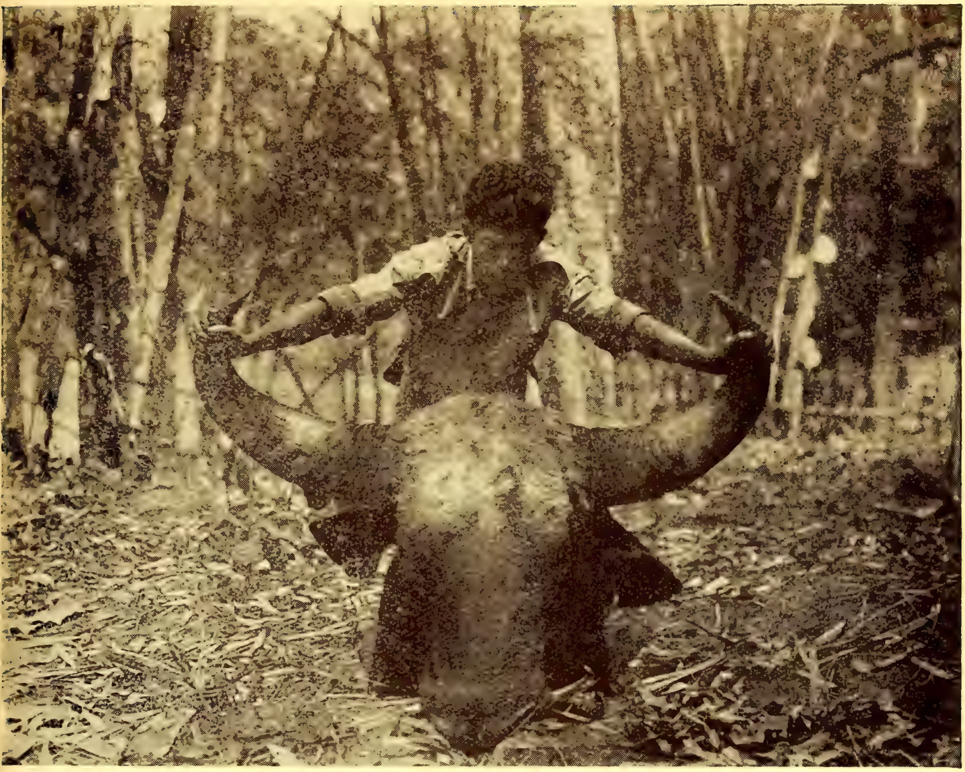
Next day we did a long hot march into the foothills to a hamlet called Ban Samui, 16 miles winding through dry jungle and undulating country covered with teak and grass. Here I halted a day and did a round through the hills to the north, to look for game. It was evidently good game country, but much of it was being burnt or had just been burnt and the game had left it temporarily. Recent tracks of bison and tsine were plentiful, we jumped a small herd of sambhar in one place and found fresh tracks of a bear in another. Jungle fowl swarmed and I found a nest containing two fresh eggs, in a curious situation. It was in a hole in the bank of a stream, the hole being about the size and shape of a Rugby foot ball, smooth inside, and with the entrance near the top. Coming back I saw an emerald dove, the first of the trip, also many other interesting birds, broadbills in particular.

We were camped in dense evergreen forest and most of the ponies strayed in search of grazing, so that we were very late in starting and had a hot waterless 12 mile march across the low hills southwards to Pong Nam Tan on the Klong Suan Mak, here a clear rippling stream with a wide sandy bed. It was here I took several specimens of *Anadebis diademoides* which to my inexpert eye looked extremely like a *Euploea* of sorts. Another butterfly, *Danais mulciber,* provided me with a curious spectacle. While pitching camp I saw a sort of wavy movement in a clearing about 100 yards away and went over to investigate. The clearing was about 50 yards wide and covered with the dead stalks of some sorrel-like plant about two feet high. On these were clustered the most amazing masses of butterflies I have ever seen. They were all of one species, *D. mulciber,* and covered the entire clearing in clotted swarms. Very few were flying; they were mostly settled wherever they could find room on the dry stalks, sometimes clinging to each other.

That night the plaintive mewings of flying squirrels seemed to be in every other tree, and I set forth with the gun to try and secure one but failed.

Next morning, April 1st, we marched early and reached the Karen village of Klong Pung To at 4½ miles. The village was, as usual, built on piles, and round the shady parts of the piles and under the floors were clustered large numbers of butterflies, *Euploea godarti* and *Euploea diocletianus.* Leaving the village we entered very fine forest, and it was here I saw the largest flocks of the Great Black and Yellow-Hornbill I have ever seen. One contained 19 birds and the second 23. Their wings made a loud rushing sound as they flew: hard to describe but quite distinctive.

We camped at Klong Pong Kapo, on a narrow shelf of the bank of a small stream. It was a great place for butterflies but also for bees, and after a while I was driven inside the tent. Mahomed Kasim amused himself with the net and shortly brought to me a fine specimen of *Papilio paradoxus telearchust* the only one taken on the trip. He brought it to me held firmly by one wing, and now has the privilege of having his thumb impression on exhibition in the Natural History Museum at S. Kensington. Fortunately it was otherwise quite undamaged.



HEAD OF BISON SHOT IN ME'WANG.

OPEN JUNGLE IN THE MAN WANG VALLEY.

I went up the stream in the evening with the net, having sent Maung U with the gun to shoot squirrels, and, not 40 yards from the tent, put up a handsome Malay Tiger Bittern. Further on I saw a couple of little tamiops which I wanted, and felt rather sore about things, until alittle later Maung U returned with a very fine Flying Squirrel (*Petaurista annamensis*) and two Jungle-fowl, one of which I gave him. He also ate the bodies of the specimens after skinning. All the camp here ate freely of a white flower, rather like a large and very fleshy spiraea, which they said was excellent when cooked. I tried it, but found it had an unpleasant musty flavour.

Next morning I climbed the hill behind camp to look for game, and at the top of a ridge about 800 feet above camp came on a sounder of pig 15 strong. I wasted so much time looking for a boar that they got my wind and bolted, a snapshot failing to kill. There was no boar in the lot but they were all of the lean black heavily crested type which I had seen near Lampha. I saw a couple of barking deer in the course of the morning but failed to get either.

On the 3rd we marched about 10 miles mostly through an evergreen jungle. At 3½ miles we reached the Klong Sai, where I shot a Lesser Thick-billed Green Pigeon and a Great Hornbill. The latter's breast provided a couple of excellent fillets later on. Fording the Klong Sai we entered the densest bit of evergreen forest of the trip. It was about 5½ miles to camp, and for a great part of it one could not see a man five yards behind one on the track. I shot a Green-legged Hill Partridge at one place by kneeling down and peering through the stems, but it took us ten minutes and hard work with a dah to recover it. In places where the path opened to a yard wide, I took several lovely *Arhopalas,* mostly *atosia* and *alea.* They flit across from one evergreen to another with a flash of Antwerp blue in a patch of sunlight and seem to vanish until one detects a sober brown insect settled on a leaf with closed wings. Near camp I took several specimens of *Lebadea martha,* also one of *Laringa glaucescens,* the only one seen. E Ka Klo was a bad camp, very cramped in a narrow valley with dense jungle. In the evening a mouse-deer was added to the bag. Here occurred our first serious misfortune. That evening four ponies were missing. I had a grazing guard out of two men, but they came in at sunset to fetch halters, saying the ponies were alright and about 200 yards upstream from camp. Half an hour later they came in with 10 ponies saying four could not be found. At 2 A.M. two ponies trottled into camp and next morning I found by their tracks that they had been right over the next ridge. We searched all next morning but the jungle was desperately thick and I fancy the missing two were quietly removed by tigers whose stronghold we were just entering.

We reached Klong Klung next evening, passing the Man Wang stream at three miles, and ten miles in all to a bad camp by an old grass grown village site in the river bed. Here the Siamese guide brought me a fruit with a hard woody outside, the size of a large lemon, and recommended me to try the inside. I found a little mawkish pulp and some seeds inside, neither of which were to my taste. The Siamese asserted that the Great Hornbill eats this fruit I asked him how they opened them, and he said they eat them whole, which I doubted until he was backed up by all the others. Later I shot a Hornbill with one in his crop, but how he swallowed it or how his digestion tackles the thick woody shell I do not understand.

I halted next day to send for some rice from a village about 5 miles down stream and myself had a try round for game, jumping some sambhar and a barking deer. It is very hard to walk noiselessly in thick dry jungle, but the Karen with me insisted on putting aside every stick and bamboo to allow My High Mightiness to pass ; usually breaking off the branch with a loud report or standing on a bunch of dry bamboos with a very good imitation of a Gatling Gun. This did not make hunting any more easy.

On April 6th we began to get into real game country. We marched westwards up the Klong Klung for 4 miles, then turned S. up a subsidiary stream called the Hue Tah So about 11½ miles in all. About two miles before camp I saw fresh tsine tracks, and thought of stopping to take a rifle off a pony, but decided not to as it meant off-loading, and it was an improbable chance after all. I had a gun and lethal bullets with me. A mile on we topped a ridge and came to a slope of fresh green grass, and there, 100 yards away down the slope was a herd of tsine, 5 or 6 cows and two bulls. One of the latter was a young one of the usual rufous colouring, but the other was nearing his prime and had a very curious coat, grey down to the middle lateral line, then red below. I have seen many tsine bulls but never one like that. I ran down behind the cover of a fallen tree, pushing a couple of lethal bullet cartridges into the gun, and got within about 20 yards, took careful aim at the bigger bull and pressed the trigger. Result two miss-fires. The herd now must have got my wind, for they made off to my right, disappearing in some bushes, but came on top of my ponies and turned off. The bigger bull, however, came straight back towards me. I had changed the cartridges and tried again when he was within 20 yards, result two more miss-fires. He had been coming straight at me where I stood partially under cover of a fallen branch. He must then have caught sight of my topi, stopped dead just as I pressed the trigger for the second attempt, turned round and made off. Up to then I certainly thought he was charging me, which shows how careful one must be in making such assumptions. I discovered the cause of the miss-fires later. There had been a heavy shower of rain the day I went out from Ban Samui, and Gunjanaw had been carrying my water proof haversac with the flap pushed inside, so that all the rain had entered and formed a pool at the bottom. The four lethal cartridges had been in this, and I had told Gunjanaw to throw them away and take four more from the gun case ; instead he had dried them and replaced them. A mile through open grass and tree jungle and we turned off the track and descended to a stream to camp. Near the bottom out burst a bull bison and was gone in the jungle on the opposite bank just giving me a glimpse of a fine pair of horns.

Arrived at the bottom, I found a nice shady flat beside a gravelly stream, and we started to camp. Then things began to happen to Nawash Ali. He put down his hurricane batti on the ground by the tree at the foot of which he intended making the kitchen fire. Out dashed a jungle hen from the dead leaves amongst the roots, knocked over the lamp and fled with a squawk. This startled the bearer but we were five fresh eggs to the good and in an eggless country. Then Nawash Ali lit his fire and about two minutes later he and Mahomed Kasim leapt in the air with a yell and fled in different directions. On enquiring I found they had been stung by a "shaitan." Approaching carefully I discovered a wasp's nest on the tree trunk about 10 feet above the still smoulding fire. It was just like overlapping scales and was inhabited by a small dark brown wasp with no yellow markings. Later on we removed the kit to a site further down, but in the process Mahomed Kasim got stung again, this time on the nose, and I got stung on the hand. I can testify to the virulence of my sting, while Mahomed Kasim's nose gave visible, and much enlarged, evidence. I am glad to say we were not the only sufferers. Maung U, having nearly split himself laughing at the victims, went to fetch the hurricane batti when he thought all was safe. He bent over to pick it up, and—afterwards went to sit in the nice cool stream for a bit.

I had a look round for a tsine in the afternoon, but although I saw plenty of tracks, both old and fairly recent, none of the makers were to be found. That night we heard elephant to the W.

On the 7th we started early, and after a short climb of 250 feet, crossed the dividing ridge into the Mewong watershed, the valley we entered trending S.E. about 1½ miles gradual descent through open tree and grass jungle, where tupaia's abounded, brought us to a dry sandy nullah full of brushwood, where there were fairly recent tracks of bison, and where we lost the path in the undergrowth. It took the best part of an hour to pick it up again, and then we climbed about 600 feet to the west of the next ridge, and dropped down 300 to a small spring at the head of a very pretty open gravelly valley, all scattered trees and long grass. Here I disgraced myself by letting sentiment get the better of science. A couple of large langurs appeared in front of me, and jumped into a small tree about 30 yards away and sat looking at me. They were light, almost white grey with long fine hair, and appeared much bulkier than our familiar *Presbytes entellus.* Also their hands and feet were not black. I felt I ought to slay one in the interests of science, but I loathe killing monkeys, and these two were so particularly confiding that I could not bring myself to do it. I fancy they must have been *Presbytes robinsoni.* The track now kept up almost level on high ground W. of the nullah bed, and steadily for four or five miles along it were the fresh tracks of a tiger who had proceeded us only by an hour or less. At about 8 miles the track took us across a series of low jungle covered ridges until we found overselves descending into what was evidently the main valley of the Mewong stream. Here we lost the track altogether, and after two miles of struggling through bamboo jungle, we came to a dense belt of jungle clothing the river bank, through which we had the greatest difficulty in finding a way for the ponies. Eventually we emerged into the river-bed, here sandy and about 80 yards wide, and after paddling up stream for half a mile through a couple of inches of clear running water, I found a suitable camping ground on the right bank.

While pitching camp a tiger roared in the forest on the opposite bank, and this sound I was to hear every few hours for the next week. Tigers are very numerous in the Mewong, and unusually noisy.

Since leaving Hkambengpet we had marched almost due south, except for the first two days ; we now turned west up the Mewong, and I pushed up the left bank on the 8th looking for a suitable camp.

The track was decidedly rough, the first two miles across a fairly open depression, then up among the ridges high above the stream. At seven miles we descended to the flats by the river, which now flowed amongst rocks and grass-covered sandbanks, and made our way through a stretch of most abominable bamboo-thorn. I was about 200 yards ahead of the ponies when there was a tremendous rush and crashing of bamboos on my left by the river, and I ran through the tangle as fast as I could, arriving with a scratched face and a mere remnant of a shirt, just in time to see the tail end of a buffalo disappear into the jungle on the far bank. It was impossible to take up the chase then as I had to see the camp pitched, and I had not yet found a site. Returning to the track I put up a sambhar and two barking deer in the next half mile, and then the track led us across the river and I found a good site for camp on a bamboo flat on the right bank. Here I shot a Black-necked Stork for the breast fillets, which are quite good eating.

Camp was on the east side of a long narrow loop the river makes in flowing round a low jungle-covered ridge. This loop was about ¾ of a mile in depth, but across the neck of the ridge was only about 350 yards, and in the evening I crossed it to explore the valley to the north. On reaching the river again on the far side of the ridge I found a boggy patch covered with tracks of bison, tsine, buffalo and tiger. Some of these last were fresh, but all the others were from two to four weeks old with one exception, that of a solitary bull buffalo, evi-

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Note.—I have been in the Mewong again this year in February, and saw five tigers (shooting two of them) and the tracks of many more but never heard one roar, and only once "the titting" call. Is this seasonal Comment invited.—C.H.S.

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dently my friend of the morning. About five hundred yards higher up, the valley widened and there was a stretch of reeds and marsh about a couple of acres in extent, and I tracked the bull into this. Not being fool enough to take on a buffalo in high reeds and sticky mud, I lay down under cover on a high portion of the right bank and waited until after sunset in the hope that he would emerge for his evening feed, but nothing showed, though a tiger roared in the jungle behind me. On the way home I jumped another tiger as we came down the slope of the ridge which faced camp, and he had evidently been watching the ponies grazing in the river-bed. I got rather a shock when he bolted from behind a bush twenty yards away, but this was only the prelude to an unpleasantly lively night.

I had dinner shortly after dark and had just finished when I heard some large animal snorting on the far bank of the river. There was a fire burning at each end of the camp, but the beast entered the river-bed and came towards camp "click, clack" over the loose stones and, after splashing through a couple of pools, halted, snorting and breathing heavily, about thirty yards from me. By this time I had my rifle and was entrenched behind an absurdly inadequate tree, peering at the black mass through the darkness, and uncertain what to do. The whole camp was in awed silence, broken only by Nawash Ali, who remarked in a strained whisper when the brute shifted its feet, "It's going to charge now." This lasted two or three minutes, and I was greatly relieved when our visitor turned with a contemptuous final snort and walked back whence he had come.

I had naturally assumed from his truculent attitude that I had had a buffalo to deal with, and had visualised the nasty results if he charged the camp in the dark, but I was greatly surprised, on inspecting the tracks with a lantern, that it had been a bison bull which had behaved in this eccentric and trying manner. I traced him for two or three miles in the morning, and he seemed to be making steadily for the Klong Klung by the track which we had followed. This incident over, I went to bed and had just put my head on the pillow when there was a nerve-racking "aungr-r-r-r-h" from a tiger about thirty yards from my bed, quickly followed by a repetition of the noise from the men's end of the camp: two of the brutes undoubtedly, and more trouble. Yells and cries from the men, and snorts and violent halter-straining by the ponies which the enemy were evidently trying to stampede into the river-bed. I shouted to the men to get to the ponies' heads, and was still hunting for a stray shoe when the sounds were repeated and two ponies broke away. This was too serious, as the previous loss of two at E Ka Klo had cut my transport and rations very fine, so I made a wild dash and fortunately managed to grab both ponies just as they reached the foot of the bank, and hung on until the orderlies and one ponyman reached me. None of the others would move from the fire.

After hobbling all the ponies with loading ropes and lighting two more fires I went back to bed, and though we were twice again disturbed during the night nothing untoward happened, our enemies giving a final and combined roar while I was dressing at dawn.

Tigers were undoubtedly very numerous and unusually vociferous in the Mewong, and although it is a common trick with lions I have not before heard of tigers trying this stampeding game on a camp. The Karens all said that the tigers there were only dangerous to men who travelled alone, and that they never attacked two or more together. I gave orders that no one was to leave camp for woodcutting or other purposes unaccompanied, and were not to go more than a couple of hundred yards.

I had decided to try downstream that morning, but found that the lower I went the scarcer the game seemed to become, though about three miles down I heard a sound, twice repeated, which could only have been a rhino bubbling in his wallow. The Karen with me immediately said "Rhino." A search of the hill from which the sounds had come was quite unsuccessful, and I could find no tracks. The river here flowed though hard black rocks full of deep pools, and the bed was so broken that progress was very difficult, and as the bamboo thorn on the banks was an even worse obstacle I turned back at about 10-30, shooting a buck barking deer a mile below camp and getting in about noon.

The whole camp seemed to be engaged in paddling and Maung U came up to me with a handful of eggs which I immediately took to be from an owl's nest, as they were spherical in shape, with hard glossy shells through the white of which the yolks showed faintly pink. Maung U then told me that they were from a turtle and showed me a female which they had just caught and which weighed 16 pounds. All the turtles' eggs I have seen before were dull white with chalky leathery shells. The men caught a lot of smaller turtles and also a land tortoise weighing over twenty pounds. I sent the carapace of both the big turtle and the tortoise to Dr. Malcolm Smith and he said he was not certain of the species. A little later a large tortoise was captured weighing over 20 lbs. The turtles' eggs were excellent eating, and I got over 40 of them, though I do not know whether they all belonged to the same female.

Shortly before getting back to camp I had heard the sound of a shot from up the valley, and found the guide and the Karen hunter had gone out to find the track for the next march. They came in about 1 o'clock, and I taxed them with having fired. They denied it at first, but on my pointing out that the Karen's muzzle-loading blunderbuss had been very recently discharged, they admitted that they had seen the buffalo bull on their way back, and had fired to frighten him away, as he was in the middle of the river-bed. On going out in the evening I found that they had succeeded so thoroughly that the bull had departed by the same game track as the bison bull had taken ; and evidently for the same destination. This was annoying, as buffalo were evidently scarce.

About 3 o'clock I saw two of the pony-men emerge suddenly from the opposite jungle and walk rapidly to camp, where they sat down in the shade with rather a chastened mien. On enquiry I found that they had disobeyed my orders, and wandered off to have a look at the country from the neck of the opposite ridge. Here they met a tiger suddenly ; evidently the same one which I had jumped the previous evening. I took the rifle and went across to look for him but failed to get a shot, though I caught a glimpse of his tail end as he made off.

Next day, the 10th, I shifted camp five miles upstream to get nearer the pass and find the onward track.

The path was very hard to follow, and in a bit of thick evergreen we were quite deceived by an elephant path. A small herd had walked along the track in file, and on into the jungle. Where they had walked was a nice beaten path, and we very naturally missed the point where they had diverged from the right track and followed their route. After about half a mile they had dispersed to feed and our nice beaten path ended suddenly in a tangle of broken bamboos, so we had to return and search for the right trail.

About three miles up the river we crossed to the right bank and I sat down on a large fallen tree to wait for the ponies. While there, a hen silver pheasant jumped on to the trunk about 15 feet from me, and I was interested to note that her breast feathers showed no V-shaped white markings as in the hen which I had shot at Pang Yao, but only small white spots. She flew away after about a minute, and I then rose and immediately put up a fine cock from almost under my feet. He was remarkable for a very long and pure white tail. The Pang Yao birds were got at about 3,000′, while here we were only at about 700′, and the character of the jungle was quite different; at Pang Yao it had been mainly big evergreen forest, here the trees were mostly deciduous mixed with bamboo, the forest smaller and the humidity much less.

Crossing the river we entered a tract of giant bamboo growing on a level flat with plenty of grass beneath them. This flat was covered with old tracks of two small bands of buffalo, three and five in number, and they had evidently been residing there up to about three weeks previously. I also picked up here the skull of a bull buffalo with horns about 40 inches long, which, judging by the teeth and cranial sutures, was not an old animal.

Leaving this flat we forded the river twice to cross a small loop, and climbing up the right bank, came on a nice spring about 40 yards inland, at the foot of a magnificent *Ficus* which was in fruit and crowded with green pigeon ; mostly the Pin-tailed species, but also the Thick-billed and Orange-breasted. As we approached the spring three sambhar dashed away from a patch of undergrowth. Judging by the size, I think one of these was a stag, but I saw no stag with horns out of the thirty or more sambhar which I saw in the Mewong, and I think they had just shed them.

Leaving the spring we entered a beautiful glade of grass and teak trees, which was covered with old tracks of game, and re-crossing the river, camped amongst giant bamboo on the left bank.

In the evening I explored the valley above camp, and found the jungle very thick, with numbers of sambhar in it. I came on a party of half a dozen in the river-bed, and shot a hind for meat. She fell on the opposite bank and rolled down through some bushes, and I went across to examine her. Finding she was badly afflicted with that curious sambhar disease "sore neck," I caught hold of the head to pull her into a better position, and was immediately covered with red ants, a nest of which she had torn down in falling. I had to run to a pool and divest myself of shirt and shorts as quickly as possible, but did not escape without a severe biting. "Sore neck" has never been explained satisfactorily. Evans in "Big Game Shooting in Upper Burma," says that all sambhar have it ; but though this may be so in the wild state it certainly is not in captivity as I have recently examined sambhar in both the Calcutta and Karachi zoos, which showed no trace of it. It begins with a circular naked patch the size of a rupee, which has a small raw spot in its centre, and which may spread so as to cause the loss of all the hair of the neck except the crest, as had happened in the case of this particular hind.

On the way home I had a very curious experience. We were about 500 yards from camp and heard a sound like the blows of an axe quite close to us. I was annoyed, as I thought that some one had disobeyed orders and gone too far to gather fuel. I traced the sound to a dead tree about 150 feet high, and walked round it with the Siamese guide trying to locate our man, who, by the sounds, seemed to be about fifty feet up the tree. We could see nothing, and were standing there puzzled, when, with a loud rending crack, the tree began to fall straight towards us, and it was only by a speedy dash to one side that we avoided being crushed beneath it. The sounds we had heard were evidently the preliminary breaking of dead fibres inside the trunk, but the effect of the incident was disturbing, and I sympathised with the Siamese who said the Mewong was full of devils.

This man had told me that he knew of a salt-lick to which the buffalo had probably gone, so I took him out next morning and went down stream to Pigeon Tree Spring, then started up the hill to the south. We laboured up a long way and the ground grew less suitable for buffalo the farther we went, so I finally demanded an explanation from the guide. He said that he thought I wanted sambhar : the fact of the matter being that he had not expected to be taken out after buffalo, and funked it. I started down the next ridge, seeing a dozen or more sambhar, and half way down found the fresh tracks of a bison bull. From the tracks he did not seem to be unusually big, and I wanted buffalo much more than bison, but as they led in the right direction I took them up.

They led me straight down to the giant bamboo flat where I had found the buffalo skull the previous day, and, passing through this entered a tract of bamboo thorn. Fortunately I had not far to go through this, and after about 200 yards, up rose my bull from a small knoll about 35 yards away. I could only see him indistinctly through the bamboo, and he turned and trotted off to the right, so I dashed in to cut him off, passing the guide who was squatting grey with fright, and ran into my bull at about 25 yards range, when a bullet through the heart as he swung round to meet me, settled matters.

I had been very lucky in finding a fairly clear lane through which to attack, but I found I was still more fortunate when I saw what a grand trophy I had secured. He measured 45½ inches across the horns as he fell, and now, after drying and shrinking, they measure 44¾ inches across, with a girth of 20 inches and length of 31½: this is as shown in Rowland Ward's "Records of Big Game" (8th edition) in which he tops the list of heads measured by them.

I sent back the guide for more men, and, after photographing the bull, skinned off his neck—skin to the head, which I then cut off, and it took four men to carry it back to camp, where it took me three hours labour and the acquisition of some grand blisters on my hands, to complete the skinning. Paring the skin took several hours a day for the next week, as the skin dried hard as flint on the inner surface in the heat and remained soft in the centre, so that even with the most careful use of preservatives I almost failed to save the mask.

(To be continued.)

INDIAN DRAGONFLIES.

BY

MAJOR F. C. FRASER, I.M.S., F.E.S.

Part XVIII.

(With 2 Plates and 2 Text-figures.)

(*Continued from page* 680 *of Vol. XXIX.*)

Group—ONYCHOGOMPHUS Laid.

(=Genus—ONYCHOGOMPHUS Selys.)

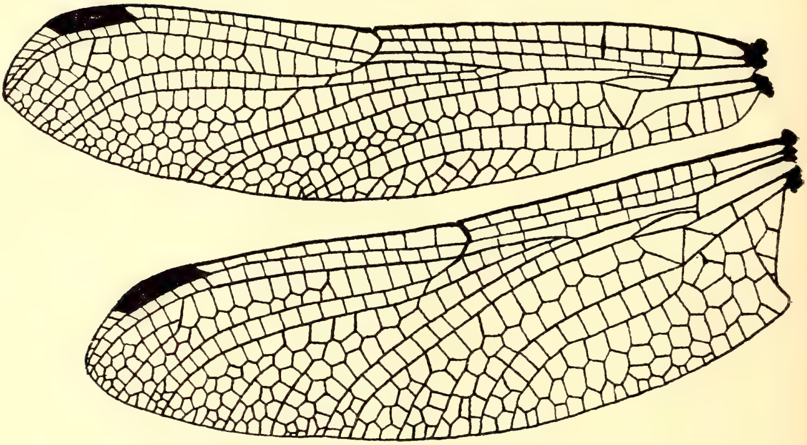


Fig. 1.—Wings of *Lamellogomphus acinaces* Laid. ♂

In this group are included all the species belonging to the Selysian genus *Onychogomphus*. It has long been evident that such a heterogeneous collection of species must sooner or later be split up into a number of subgenera and so far as the Indian species are concerned, Laidlaw has already begun this dissection by splitting up the genus into four sections.

Of these, in this paper, Section II becomes genus *Mesogomphus* Forst. and Section IV genus *Lamellogomphus* gen. nov. Dr. Ris in discussing the former genus, an African one, states that it probably embraces some species from India, obviously having in mind *Onychogomphus lineatus* Selys and allied species. A careful comparsion of this species with others of the genus *Mesogomphus* fails to reveal any characters of sufficient importance to separate it from the genus. As regards raising Section IV to generic rank, in addition to the striking and characteristic facies of the insects composing the group, I am relying on certain larval characters which in themselves are of sufficient importance to justify the step. Although most of the larvæ are as yet unknown, I think it quite safe to infer that they will all be found eventually to share the characters of those of *L. nilgiriensis* and *acinaces*.

Lastly as regards Sections I and III, more material, especially larval is needed before any further steps in classification can be adopted, these two sections are therefore grouped together under the original genus *Onychogomphus*.

In writing up the group I have been greatly helped by, and am much indebted to Messrs. H. Stevens, H. V. O'Donel and C. M. Inglis all of whom have generously contributed material without which much of the descriptive matter could never have been written.

GROUP CHARACTERS.

Fore and hind wings showing equal specialization in regard to transverse nervures between *Mi-iii* and *Miv*; sectors of arc well separated, parallel at origin and well curved; *Cui* and *Cuii* in hindwing parallel or nearly so as far as wing margin; pterostigma braced; *Miv* and *Cui* in fore wing parallel as far as level of node; *Ai* separated from *Aii* by two rows of cells from immediately below the substrigone; 2 or 3 rows of cells between *Mi* and *Mia* at level of outer end of stigma. Legs short, hind femora only slightly overlapping the posterior end of thorax when adpressed.

Larva very variable.

Genus—LAMELLOGOMPHUS gen. nov.

=Genus—ONYCHOGOMPHUS group—O. BIFORCEPS Selys.)

Moderately large to large insects with a jet black ground colour and limited but sharply defined yellow or yellowish green markings.

Dorsal bands confluent or not confluent with mesothoracic collar; humeral stripe present, vestigial or entirely absent; dilatation of end segments of abdomen begins abruptly at base of segment eight, the apical half of segment seven barely dilated. Anal appendages of great length, the inferior usually overlapping the superior which, except in *acinaces* are strongly hooked downwards so that the dorsal surface of their apices comes into contact with the dorsal surface of the inferior appendage; branches of latter separated near origin, then converging again until the apposed apices enclose a small oval foramen.

Genitalia variable.

Larva with the penultimate segment of antennæ broadened into a flat triangular lamella; abdomen short, stout and strongly keeled.

Hab. Densely shaded rocky mountain streams. Genotype *Lamellogomphus biforceps* (Selys).

Lamellogomphus biforceps (Selys.)

> *Onychogomphus biforceps* Selys, Bull. Acad. Belg. (2), xlvi, p. 420 (1878); Kirby, (*Lindenia biforceps*) Cat. Odon. p. 60 (1890); Will. Proc. U. S. Mus. XXXIII, pp. 308, 312 (1908); Laid. Rec. Ind. Mus. p. 407, Vol. XXIV (1922).

Male: Abdomen 41 mm. Hindwing 32 mm.

Head black, labium dark brown, labrum marked with a transverse yellow oval spot on each side, the base of mandibles, anticlypeus and a broad stripe across the upper surface of frons bright yellow, the base of frons black, this colour extending as a short tongue into the floor of sulcus. Occiput black with a small median spot of yellow, slightly rounded, ciliated along its free margin.

Prothorax black with a lateral spot of yellow.

Thorax black marked with greenish yellow as follows:—a complete mesothoracic collar confluent with a stripe on the lower part of the middorsal carina, a dorsal oblique stripe not joined to the mesothoracic collar, and a humeral stripe. Laterally yellow marked with two broad black stripes on the sutures, the black converging and becoming confluent at the middle of the stripes. Beneath black.

Legs black, the four posterior femora with an outer yellow band.

Abdomen tumid at base, thin and cylindrical as far as segment 8, which is abruptly dilated, 9 and 10 narrowing again slightly, black marked with bright yellow as follows:—the sides of segment 1 and a triangular spot on the dorsum, two large spots including the oreillets on the sides of segment 2 and a lobed stripe on the dorsum, segments 3 to 6 with narrow basal rings nearly divided by the black of dorsal carina, occupying about one third of the segments, in addition an oval spot at the middle of these segments, the basal half of segment 7 and a small rounded spot near the base of both sides of segment 8.

Anal appendages rather longer than segments 9 and 10 taken together.

Superior yellow changing to black at the tips, thick at base where they are rather widely separated, converging, tapering and finally meeting at the apices. Seen in profile the basal thirds nearly straight, the apical third curved strongly down and circling back so that finally their dorsal surface comes to lie in direct contact with the dorsal surface of the inferior appendage. The latter black, equal in length to or projecting slightly beyond the superiors, thickened at basal third where the two branches separate to enclose an oval space, after which they come together again, tapering and curving upwards to meet the superiors. The two sets of appendages thus enclose a large subtriangular space when viewed from the side.

Wings slightly enfumed, venation black, costa finely yellow; pterostigma deep blackish brown (3 mm.), nodal index 8-16—13-9.

Female undescribed. Martin in "Mission Pavie" states that the female is very like the male but the yellow spots on abdomen are much larger, he gives no detailed description unfortunately.

Hab. Darjeeling. Type in the Selysian collection; another male in the Indian Museum collection, taken in May 1913. These, so far as I am aware, are the only Indian specimens known but Martin has recorded it from Tonkin where it is apparently not uncommon.

Lamellogomphus inglisi sp. nov.

Male: Abdomen with appendages 41 + 4 mm. Hindwing 36 mm.

Head. Labium pale yellow, the border of median lobe narrowly brown, base of mandibles broadly greenish yellow, labrum glossy black with a large transversely oval greenish yellow spot on each side, anteclypeus and a large spot on each side of postclypeus against the eye citron yellow, frons black, greenish yellow above, this colour slightly overlapping the foreborder, base of frons narrowly black which projects for a short distance into the sulcus, rest of head matt black except for an obsolete spot on occiput which appears to be due to translucence of a greenish yellow spot on its posterior surface. Border of occipital scale rather sinuous, fringed with long black hairs. Eyes bottle green.

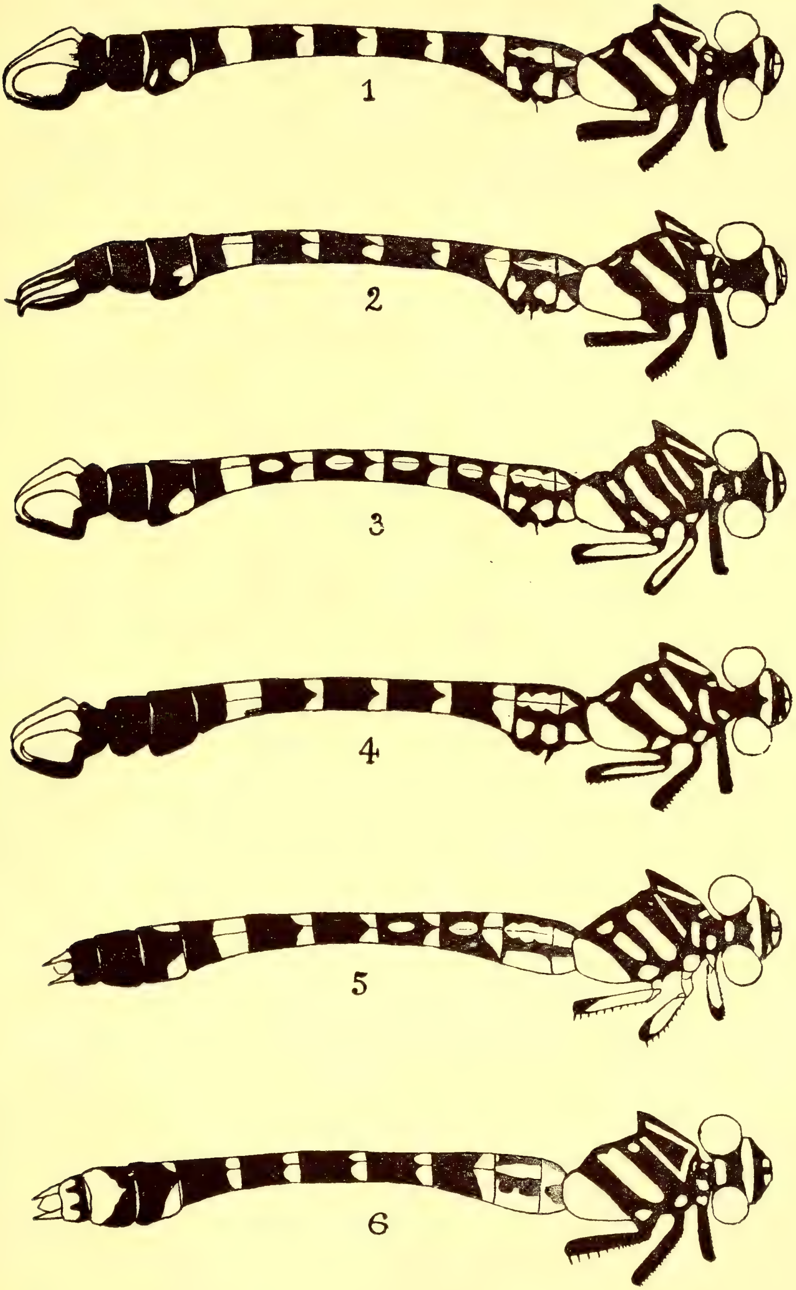
Prothorax black with a small citron yellow spot on each side.

Thorax black marked with yellow as follows:—a mesothoracic collar narrowly broken in the middle line, antehumeral oblique stripes extending from the alar sinus but not meeting the mesothoracic collar, a vestigial humeral spot above, the whole of the sides except for a very broad median black stripe which bears a small transverse oval spot of yellow immediately below the insertions of wings.

Legs black, *the posterior pair of femora only* bearing an outer yellow stripe. Coxæ and trochanters yellow. Hind femora furnished with a row of closely-set evenly spaced short but robust spines on the outer side; mid femora with longer, less closely-set spines.

Wings palely enfumed, costa finely yellow to well beyond the node, nodal index $\frac{12\text{-}17}{13\text{-}12}\Big|\frac{17\text{-}12}{13\text{-}14}$ stigma well braced, black, 3 rows of cells between *Mi* and *Mia*.

Abdomen tumid at the base as far as segment 2, very narrow and cylindrical as far as extreme apex of segment 7; 8 to 10 greatly expanded, black marked with yellow as follows:—segment 1 with a large lower lateral spot and a linear transverse apical dorsal spot, 2 broadly yellow on the sides including the robust oreillets, a linear stripe on the middorsum broadening basalwards and longitudi-



EXPLANATION OF PLATE I.

1. Dorso-lateral view of *Lamellogomphus nilgiriensis*, Male.
2. The same of *Lamellogomphus acinaces*, Male.
3. The same of *Lamellogomphus biforceps*, Male.
4. The same of *Lamellogomphus inglisi*, Male.
5. The same of *Lamellogomphus malabarensis*, Female.
6. The same of *Lamellogomphus drummondi*, Female.

nally cleft at the base by a brown mark on the dorsal carina, segments 3 to 6 with basal annules occupying about the basal fourth of segments, all nearly cleft by an invasion of the black along the dorsal carina posteriorly, segment 7 with rather more than the basal half greenish yellow, the basal half of this marking on the sides is squarely pale brown. Segments 8 to 10 unmarked.

Anal appendages about the length of segments 8+9, the superior yellow, posterior two thirds straight as seen in profile, apical third curling strongly down and then actually back so that finally its dorsum comes into contact with the dorsal surface of the inferior appendage. The latter black, cleft to its base, curving at first down and then bent at a right angle and prolonged to overlap the superiors. A little dilated at base, then thin and cylindrical for as far as middle third where it dilates rather abruptly and tapers to the ends, its branches separated at base to enclose a long oval space. The appendages by their apposition enclose a large cordate space as seen in profile.

Genitalia—lamina broad depressed and obtusely notched, inner hamules converging long sinuous, broad at base and tapering to a fine outwardly turned point, outer hamules broad and conical, projecting well beyond the genital sac and bearing a stiff pencil of hairs at the apices, lobe broad and deep, funnel-shaped but not markedly prominent, surface black and coarsely corrugated.

Female: Abdomen 45 mm. Hindwing 38 mm.

Very similar to the male, markings similar in every respect. Wings rather more enfumed, pterostigma well braced, blackish brown, 2 or 3 rows of cells between *Mi* and *Mia*, nodal index $\frac{13\text{-}19}{12\text{-}14}\Big|\frac{18\text{-}12}{13\text{-}13}$.

Anal appendages yellow, very fine and rather longer than segment 10.

Vulvar scale very short triangular, deeply encased by expanded sides of segments 8 and 9. Legs coloured as in the male, hind femora with a row of short but robust closely-set spines on the proximal half and 3 to 6 much longer, more robust and more widely spaced spines on the distal half.

The markings in the Hasimara female, which is distinctly teneral, are distinctly broader and there is some evidence of a broken yellow stripe traversing the lateral black stripe of thorax and there are small baso-lateral spots on segments 8 and 9.

Hab. A single pair collected by Mr. C. M. Inglis on the Riyang River, Mangpu, Darjeeling District, 1800 ft. 17, V. 23. A female collected by Mr. H. V. O'Donel at Hasimara tea estate, Duars, Bengal.

This species differs from *L. biforceps* by the colour of the labium, the presence of lateral yellow spots on postclypeus, the vestigial character of the humeral line, the absence of middorsal markings on segments 5 and 6, the larger size and greater number of antenodal nervures. From *L. camelus* (Mart.) by the absence of excrecences on segment 8 ; by its smaller size, etc. ; from *acinaces* by the shape of the anal appendages and from *nilgiriensis* by its much larger size and markings.

Lamellogomphus drummondi sp. nov.

Female: Abdomen 45 mm. Hindwing 40 mm.

Head. Labium with middle lobe entirely black, lateral lobes pale yellow, labrum black with a transversely oval yellow spot on each side, anteclypeus yellow, rest of face black. Frons greenish yellow, its base above narrowly bordered with black, the black only slightly encroaching on the floor of the sulcus, occiput largely yellow, raised into a point at its centre, behind greenish yellow. Eyes bottle green.

Prothorax black marked with a small yellow spot at centre of posterior lobe in front of which is a much larger geminate spot of the same colour, finally a large spot of yellow on each side.

Thorax black marked with yellow as follows :—a complete mesothoracic collar, oblique antehumeral stripes extending from the alar sinus above to the mesothoracic collar below with which they blend, a minute upper spot representing a vestigial humeral band, laterally yellow marked with a broad median black band which bears a minute yellow spot above just below the insertions of wings and a very narrow line well separated from it below.

Legs black, *the anterior femora only* bearing a well defined yellow stripe on the inner side. Armature similar to that of the female of *L. inglisi.*

Abdomen black marked with yellow as follows:—segments 1 and 2 broadly yellow on the sides, a broad middorsal stripe tapering gradually from the base of segment 1 to apex of segment 2, leaving a narrow black stripe between itself and the lateral yellow, segments 3 to 7 with yellow basal annules occupying nearly the basal fourth of each segment, segment 8 unmarked, 9 with a broad dorsal yellow spot covering its apical half, 10 almost entirely yellow, marked with a small subdorsal basal triangle of black on each side.

Anal appendages short conical, bright yellow.

Vulvar scale deeply sunk between the overhanging sides of segments, short and tongue-like, about one third the length of segment 8, black.

Wings palely enfumed, pterostigma dark brown, weakly braced in three of the wings, not at all in the fourth, only 2 rows of cells between *Mi* and *Mia*, nodal index $\frac{12\text{-}16 \mid 16\text{-}12}{12\text{-}11 \mid 12\text{-}12}$.

Hab. A single female collected by Captain Drummond at Loimwe, 3,000 ft., Siam Road, Southern Shan States.

The venation and general facies of this insect are so similar to *L. biforceps* and *L. inglisi*, especially to the female of the latter, from which it is only distinguishable by close inspection, that there can be no doubt but that it is a true *Lamellogomphus*, at the same time the differences in the markings are so great as to distinguish it from any other species of the genus. It is very closely related to the two species mentioned and less closely so to *L. acinaces* and *nilgiriensis* from which it differs principally by its much larger size. From *biforceps* and *inglisi* it differs by the antehumeral band being confluent with the mesothoracic collar, by the basal ring on segment 7 of the same size as those on segments 3 to 6 and by the extensive yellow markings on segments 9 and 10. From *camelus* Mart (from Tonkin), the species is distinguished by the fewer antenodal nervures and by the sides of thorax yellow marked with a single broad black stripe instead of black marked by two yellow stripes.

Martin in "Mission Pavie" mentions a third species from Mandehowrie unknown to me, and gives neither name nor references; it differs from *drummondi* by the humeral stripes being entirely absent, by segment 8 marked with a yellow spot on the sides and by segment 9 with a similar spot instead of a broad apical dorsal spot.

Lamellogomphus nilgiriensis (Fras.)

Onychogomphus biforceps nilgiriensis Fras. Rec. Ind. Mus., Vol. XXIV, pp. 425, 426 (1922.)

Male. Abdomen (with appendages) 36 mm. Hindwing 30 mm.

Head. Labium entirely black; labrum black marked with two oval transverse spots of yellow varying in size from very large to very small; bases of mandibles greenish yellow as is also the anteclypeus (but in one specimen examined, this latter was quite black); postclypeus black; frons greenish yellow, its base above rather broadly black, a prolongation of this colour invading the floor of sulcus; rest of head black (but a good number of specimens with a rounded spot of yellow behind the occiput only visible when the head is tilted forward). Eyes deep bottle green or in younger specimens bluish green.

Prothorax black, occasionally unmarked but usually bearing a small geminate spot of yellow at centre of posterior lobe and outside this an even smaller spot.

Thorax black marked with greenish yellow as follows:—the upper part of middorsal carina only occasionally, a mesothoracic collar interrupted in the middle line, oblique antehumeral stripes generally connected to the mesothoracic collar but in a small percentage more or less widely separated thereform (in such cases, the lower end of the stripe is squared off, not pointed as in *acinaces*), humeral stripe absent (only in a single male was a vestigial spot found representing the upper part of a humeral stripe), laterally two broad stripes separated by an almost equally broad black stripe, the posterior the broadest and covering the greater part of the metepimeron, the anterior slightly narrower, the black stripe nearly always with linear longitudinal spot of yellow at its upper part close to the insertions of the wings, but this occasionally absent on one or both sides.

Wings hyaline; pterostigma black, over 5-6 cells, not robustly braced; nodal index variable: $\frac{10\text{-}15 \mid 16\text{-}11}{12\text{-}10 \mid 11\text{-}10}$, $\frac{11\text{-}14 \mid 14\text{-}10}{12\text{-}10 \mid 10\text{-}12}$; 2-3 rows of cells between *Mi* and *Mia.*

Legs black, without markings. A row of moderately closely-set robust short spines on either side of posterior femora which converge and merge into a common field at the proximal end, hind femora with a row of more robust more widely spaced spines on either side.

Abdomen black marked with bright citron yellow as follows:—segment 1 with a triangular spot on the dorsum, its base apicalward and a large apico-lateral spot, segment 2 with a dorsal longitudinal stripe broadening at the middle, tapering at the apex, the oreillets and an apicolateral spot varying in size, segment 3 with a large baso-dorsal spot deeply cleft behind by an invasion of the black on dorsal carina, segments 4 to 6 with two dorsal triangular spots situated close to base, 7 with nearly the basal half yellow, 8 with a basal spot low down on the sides, this sometimes very minute or even absent altogether (but rarely), when very large, then accompanied by a smaller apico-lateral spot, segments 9 and 10 unmarked. (In one specimen the dorsal spots on segments 4 to 6 were almost obsolete and that on 7 was cut into two by the black of dorsal carina.)

Anal appendages black, the outer and upper surfaces of the superiors bright citron yellow to nearly as far as the apex (in one specimen examined, the yellow was restricted to a short linear streak on the basal half of the outer side only). In shape exactly similar to those of *L. biforceps* and *inglisi.*

Genitalia scarcely differing from that of *inglisi*, the outer hamules however are much longer and tapering, projecting very prominently from the genital sac.

Female: Abdomen 36 mm. Hindwing 33 mm.

Very similar to the male, the abdomen stout and cylindrical; markings differing as follows:—spots on labrum smaller, band on frons cut into two large oval spots by the black at base of frons joining up with that on front, antehumeral stripe separated from the mesothoracic collar (in the only two specimens known but this may be found to be variable when more material becomes available), the first lateral yellow stripe on sides of thorax with its upper part isolated as a separate spot, yellow markings on sides of segment 2 confluent, basal spots on segments 3 and 7 separated by the black on dorsal carina, baso-lateral spots on segment 8 very minute and apical spot never present.

Occiput armed with a pair of very long robust spines at its centre, the apices of which curl outwards.

Wings enfumed and distinctly saffronated at the base; nodal index:— $\frac{12\text{-}14 \mid 15\text{-}11}{11\text{-}10 \mid 10\text{-}13}$.

Anal appendages rather longer than segment 10, tapering, black with a bright yellow tip, a long triangular protuberance between them; segments 7 to 10 progressively shortening.

Vulvar scale half the length of segment 9, cleft to its base so as to form two small triangular leaf-like processes which project back and somewhat down so as to be easily visible in profile.

Larva. Total length 23 mm. Length of hind femora 6 mm. Greatest breadth of body at about centre of abdomen 9 mm. Head moderately broad and quadrate, antennae with basal segment small and cylindrical, 3rd segment broad flattened triangular, 4th segment rudimentary, exists as a tiny spine at inner lateral angle of 3rd segment. A duplicated tubercle on the prothorax. Wing sheaths broad, extending to segment 6. Abdomen depressed, strongly keeled from segments 4 to 8 which bear robust spines on the carina, segment 7 to 10 with stout lateral spines. Mask very short, extending to base of first pair of legs, middle lobe rounded, fringed with rather long stiff brissae, mentum angulated, the whole mask nearly quadrate. The highly specialized shape of antennae gives the name to the genus.

Habitat. Nilgiri-Wynaad, Coorg and South Kanara, from the end of September to the third week of October. The insect which is very local, frequents shady mountain streams, generally those with clean gravelly bottoms and is found settled on rocks or twigs in mid stream. When disturbed it immediately rises perpendicularly to trees overhanging the stream. In Coorg it prefers streams almost entirely hidden and closed in by overhanging cane brakes where it may be found settled on rocks or on the gravelly beach or occasionally hawking to and fro over runlets or rapids to which places the female usually resorts to lay her eggs. Whilst ovipositing the female hovers some two feet or less over the surface of the water and drops her eggs perpendicularly into the swirling stream.

L. nilgiriensis is a southern species and is easily distinguished from *acinaces*, from the same districts by the shape of its anal appendages. It and *acinaces* stand somewhat apart from *biforceps*, *inglisi* and *drummondi* by their relatively smaller size, this being due to the shorter abdomen. It differs from *biforceps* by the absence of a humeral stripe and dorsal spots on the middles of segments 3 to 6, from *inglisi* by its much smaller size, by its confluent antehumeral stripes and by the absence of a vestigial humeral spot, etc., from *drummondi* by its much smaller size and by the black occiput. Its female differs from all others by the presence of two robust occipital spines.

Lamellogomphus acinaces (Laid).

Onychogomphus acinaces Laid. Rec. Ind. Mus. 1c. pp. 407-408 (1922).

Male: Abdomen with appendages 35 + 4 mm. Hindwing 30 mm.

Head. Labium black, yellow at the base; labrum black marked with a pair of transversely oval greenish yellow spots; anteclypeus yellow, postclypeus black; frons greenish yellow above, black in front, the base narrowly black, this colour sending a prolongation forward into sulcus which meets the black on front and cuts the greenish yellow into two oval spots; vertex and occiput black (In some specimens there is a small spot of yellow behind the occiput as in *nilgiriensis*).

Prothorax entirely black.

Thorax black marked with greenish yellow as follows:—the lower part of the dorsal carina (only in about half the specimens examined), a mesothoracic collar, complete where the mid line exists but broken when this is absent, an antehumeral oblique stripe not connected with the collar, squared above but *tapering to a point below*, no trace of a humeral band, laterally greenish yellow with a broad median black stripe, usually marked above near the insertions of the wings by a small linear spot of yellow.

Legs black, unmarked except for a broad greenish yellow stripe on the flexor surface of the anterior femora; armature similar to that found in *nilgiriensis*.

Wings hyaline, rays of yellow tinting in the subcostal and cubital spaces; pterostigma black, over 5 to 5½ cells, braced; usually 2 but sometimes 3 rows of cells between *Mi* and *Mia*; nodal index :— $\frac{10\text{-}16}{11\text{-}10}\Big|\frac{15\text{-}11}{11\text{-}11}$, $\frac{12\text{-}15}{13\text{-}10}\Big|\frac{16\text{-}12}{10\text{-}12}$.

Abdomen black marked with greenish yellow as follows:—segment 1 with an apical triangular spot, its base resting on the apical border and continuous with a middorsal stripe on segment 2 which expands medially and tapers apically, segment 1 has also an apical lateral spot, segment 2 with two large yellow lateral spots, the proximal including the oreillet and its surrounding area, segment 3 with a large basal spot nearly cut in two by an invasion of black along the dorsal carina, 4 to 6 with smaller spots nearly or quite cut in two, 7 with its basal half yellow and 8 with only a basal spot on the sides very variable in size, usually quadrate and acutely indented on its apical border, 9 and 10 unmarked.

Anal appendages black, the superiors with the upper and outer surfaces bright yellow as far as the apices. In some specimens these appendages are entirely yellow and in such the upper surface of the inferior is of the same colour. Entirely differing in shape to those of all other species, the superiors truncate, tapering sinuously backwards and sloping slightly downwards towards the apices, equal in length to the two last segments of the abodmen, inferior slightly longer, divided into two closely parallel branches almost as far as its base, the distal halves curved gently upwards.

Genitalia almost similar to the last, the inner hamules are much stouter and more robust, the outer shorter and stouter, the pencils of hairs at their apices very long and prominent.

Female (hitherto undescribed): Abdomen 39-40 mm. Hindwing 32-35 mm. Abdomen tumid at the base, stout, parallel-sided and cylindrical as far as the anal end, black marked exactly as in the male except for the 2nd segment where the whole side is bright yellow, this in some specimens confluent with the broad middorsal stripe, segment 8 unmarked. The dorsal carina on segment 7 usually finely black so that the basal spot is cut in two.

Anal appendages yellow, very short and conical.

Occiput fringed with long black hairs, slightly notched in the middle, without the spines seen in *nilgiriensis*. Legs as for male but the hind femora furnished with a row of very long, very robust, very widely-spaced spines as in *nilgiriensis* female.

Hab. Coorg, North and South Kanara. Found in company with *nilgiriensis* in similar situations. Easily distinguished from all other species of the genus by its abnormally shaped appendages. The species is very closely related to *nilgiriensis* and apart from the appendages the only reliable character by which to distinguish them is the pointed lower end of the antehumeral stripe in *acinaces* and the absence of occipital spines in the female. *L. acinaces* is a far more static insect than *nilgiriensis* which as has been noted above, exhibits considerable variations; this taken with its specialized anal appendages and with its enormous preponderance in numbers would indicate that it is a more modern and dominant insect and must eventually lead to the extinction of *nilgiriensis*.

The type which is lodged in the Indian Museum was taken by Dr. S. Kemp in North Kanara (without date, probably October 1916). This was the only specimen known until October 1923 when the species was rediscovered by myself in South Kanara, and in considerable numbers. A large number of specimens were taken on streams flowing down the Mangalore Ghat from Coorg to Kanara and eventually Mr. C. Souter, Commissioner of Coorg, found it swarming at Bhagmandala, Coorg—"After having taken about 50 males I grew tired of taking more and contented myself with capturing females of which I was fortunate enough to take six out of 10 specimens seen. All were hovering over a deep pool formed by damming up the river below, and were busy ovipositing by dropping their eggs plumb into the stream." From Mr. Souter's remarks it will be seen that their mode of oviposition is an exact parallel of that of *nilgiriensis* as observed by myself. The credit of the discovery of the female goes to Mr. Souter. The females of these two species are easily distinguished by the presence of occipital spines in *nilgiriensis* and by the antehumeral stripes in *acinaces* pointed instead of squared below.

Lamellogomphus malabarensis sp. nov.

Female (Male unknown): Abdomen 42 mm. Hindwing 35 mm.

Head. Labium pale yellow; labrum yellow broadly edged with black with a prolongation of this colour from the base joining the anterior border of black; anteclypeus yellow, postclypeus black with a large spot on each side close up to the eyes; frons black traversed by a broad stripe of yellow on the crest constricted at its middle by an approximation of the black; vertex and occiput black, the latter with a yellow spot at its middle which is raised into a small tubercle.

Prothorax black with a large spot of yellow on each side.

Thorax black marked with greenish yellow as follows:—a mesothoracic collar narrowly interrupted in the middle line, antehumeral oblique stripe falling well short of the mesothoracic collar, no vestige of a humeral stripe, laterally greenish yellow traversed by a broad black stripe which is traversed by a yellow stripe interrupted above by the black stripes confluent across it.

Legs. Femora yellow mottled with black, the hind femora with a row of closely-set very short very robust black spines numbering 9 to 10.

Wings hyaline; pterostigma black, over five cells, well braced; only 1 row of cells between *Mi* and *Mia* at level of outer end of stigma; nodal index:—

$$\frac{10\text{-}16}{9\text{-}11}\left|\frac{17\text{-}10}{11\text{-}11}\right..$$

Abdomen black marked with yellow as follows:—segment 1 with a dorsal spot and its sides broadly, 2 with a dorsal stripe, bilobed and extending from base to apex and its sides very broadly, 3 with a broad basal ring and a spot situated on the middle of the middorsal carina, 4 to 6 with subdorsal basal spots confluent across the middorsal carina and a middorsal spot as on segment 3 but progressively smaller from 4 to 6, on the latter of which it is almost obsolete, 7 has the basal half yellow, 8 a large baso-lateral spot, whilst 9 and 10 are unmarked.

Anal appendages yellow, small and pointed, the intermediate process also yellow.

Vulvar scale small, deeply cleft to its base into two small triangular leaf like processes, a shallow depression on segment 9 beneath the vulvar scale very similar to that seen in *M. lineatus*.

The general conformation, size and colouring (deep black with sharply defined yellow markings) of this insect are so similar to the known females of genus *Lamellogomphus* that I have no hesitation in placing it in this genus, whilst it differs so much from all other females in its markings that it must be given specific rank.

From *nilgiriensis* it is distinguished by the yellow occiput without spines and by the middorsal spots on segments 3 to 6, the latter character also serves to separate it from *acinaces* and *inglisi*, an additional point of difference being the yellow stripe traversing the medio-lateral black stripe of thorax. From *biforceps* the entire absence of the humeral stripe will at once distinguish it, lastly it differs from *drummondi* by the presence of middorsal yellow spots on segments 3 to 6, by the presence of a lateral spot on segment 8 (unmarked in *drummondi*), and by segments 9 and 10 without yellow markings.

Described from a single specimen in my own collection taken in Palghat by Mr. T. N. Hearsey, 16 VI. 21. I had taken this for the female of *biforceps* (*Rec. Ind. Mus. Vol. XXIV, p.* 124) being deceived by the middorsal spots on segments 3 to 6 which are only found in this species and in *biforceps*, I had however overlooked the fact that the humeral stripe is well developed in the latter species.

The species will probably be found inhabiting the Annaimallai or Cardamom Hills.

Genus—Mesogomphus Forster.

(=Genus—Onychogomphus groups—O. cognatus
and O. grammicus Selys.)

Mesogomphus Forster, "*Die Libelluliden Gattungen von Afrika und Madagascar*" (71 und 72 Jahresber., Mannheim. Ver f. Naturk). p. 71 (1906).

Moderately large or small insects with ground colouring sandy yellow, more or less poorly marked with pale brown, dark brown or black.

Pterostigma moderately long, shorter than one fourth the distance between the node and distal end of stigma; discoidal field in front-wing narrow, only beginning to dilate at or after the level of node; no anal loop nor vestige of such in the hindwing; legs short, hind femora not extending to hinder end of thorax; abdominal segments 8 and 9 laterally foliate; 3rd to 7th very slender and cylindrical; superior anal appendages of male much longer than the 10th segment, approximate in the mid-dorsum and contiguous for the greater part of their length, inferior appendage considerably shorter, deeply divided into two contiguous branches. Vulvar scale of female broad and short, notched; on ventral plate of 9th segment a shallow depression corresponding to the vulvar scale and bordered by a low ridge.

Larva rather long, narrow and cylindrical, antennae of the usual Gomphine shape.

Genotype *Mesogomphus cognatus* (Ramb).

Dr. Ris points out that the name as given by Förster is synonymous with that of Handlirsch's fossil genus *Mesogomphus* but as both publications date from the same month and cannot be fixed to a day, he has thought it advisable to adopt it for the living group, a procedure which is followed here.

In the key given for the *Gomphinae* in Part XVI of this Monograph, *Mesogomphus lineatus* appears under the old name of *Onychogomphus lineatus* and species *Mesogomphus lindgreni* and *risi* were not included as they had not been recorded at the time the M.S. was written.

Mesogomphus lineatus (Selys).

Onychogomphus lineatus Selys, Rev. Odon, p. 386 (1850); id. Bull. Acad. Belg. XXI. (2), p. 36 (1854); id. Mon. Gomph. p. 48 (1851); Kirby (*Lindenia lineata*) Cat. Odon. p. 59 (1890); Will. Proc. U.S. Nat. Hist. Mus. XXXIII, pp. 309-310 (1908); Laid. Rec. Ind. Mus. pp. 403-404, Vol. XXIV (1922).

Male: Abdomen plus appendages 37 mm. Hindwing 27 mm. Dehra Dun, N. India and Bihar.

Abdomen plus appendages 32 mm. Hindwing 25 mm. Deccan and Nilgiris.

Abdomen plus appendages 36 mm. Hindwing 26 mm. Coorg.

Abdomen plus appendages 33 mm. Hindwing 24 mm. Malabar and Madras.

Head: Labium pale yellow, labrum, face and frons sandy yellow, the latter with a more or less ill-defined brownish black line across the crest; vesicle and occiput yellow, a narrow transverse streak of dark brown separating them. In some specimens there is a narrow diffuse basal line of brown on upper surface of frons and the base of labrum may be clouded with the same colour. Occiput raised into a slight point at its centre and usually bearing a line of minute spines on either side of this eminence. Coorg specimens have three or four such spines on either side, a Burmese specimen has a continuous row along its free border, Dehra Dun specimens resemble those from Coorg, a Poona specimen has four teeth on one side and only two on the other and in no specimens have I found the spines altogether missing although Laidlaw states that in some of my Poona specimens they are entirely lacking.

Prothorax blackish brown, the posterior lobe narrowly and a large spot on either side yellow.

Thorax sandy yellow marked with dull or dark brown or even blackish brown according to age of specimens, as follows : a dorsal line bordering the mesothoracic collar closely and turning abruptly up on either side of the mid-dorsal carina, which is black in its upper part, an antehumeral oblique line beginning from the lower end of the dorsal line and running upwards and inwards to join this line in its upper part, thus enclosing a thin stripe of the ground colour, a humeral line on the humeral suture and two lateral lines close together, all three parallel, of the two latter, one crossing the spiracle and the other mapping out the posterolateral suture.

Legs yellow marked with black, a stripe on the inner side of all femora, an outer stripe on distal half of mid femora and a rounded distal spot or stripe on outer side of hind femora ; tarsi black. Two rows of robust evenly spaced, short spines on the hind femora which converge to form a common field of spines proximally ; mid femora with more numerous and more closely-set spines.

Wings hyaline, costa yellow as far as pterostigma which is pale reddish brown heavily bordered with black especially on the costal border, covering 4-6 cells, usually well braced ; nodal index rather variable :—$\frac{10\text{-}15}{10\text{-}11}\Big|\frac{16\text{-}9}{10\text{-}9}$; $\frac{8\text{-}15}{8\text{-}9}\Big|\frac{15\text{-}7}{9\text{-}7}$ $\frac{8\text{-}13}{7\text{-}9}\Big|\frac{14\text{-}7}{9\text{-}8}$; 5-6 rows of postanal cells ; 2 nervures between *Mi-iii* and *Miv* ; in the forewing, only 1 in the hind ; 2 rows of discoidal cells as far as node ; outer border of trigone in hindwing well angulated.

Abdomen black marked with yellow or yellow marked with black, the two colours occupying a variable space according to the age of specimens, in old adults the yellow reduced to basal annules, in young the black present as apical annules. Segment 1 with the sides broadly yellow and a large dorsal apical spot of the same colour, segment 2 has a subdorsal line of black on each side enclosing a dorsal bilobed spot of yellow, the black curving down on each side thinly behind the oreillets, finally an apical black annule of variable width, segments 3 to 7 have usually broad black apical annules occupying a variable length of the segments but generally less on 7 than on the others, a lateral line of black runs from the apical annule on each side and extends just short of the base, the dorsal carina and jugal sutures finely black. In some specimens the lateral stripe shortens as traced from 3 to 7, in others the jugal suture is so broadly black that it cuts off two dorsal spots of yellow fore and aft of itself ; segments 8 and 9 with wide dilatations at their sides, black on the dorsum except for a fine basal annule and an irreguar spot of the same colour on the middorsum, more evident on segment 8 than 9, segment 10 sandy yellow with the basal half or two-thirds of the dorsum black. The terminal three segments show considerable variation, thus the foliate lateral processes may be broadly edged with black or almost entirely blackish brown and the dorsal surfaces may be entirely deep black save for a fine basal ring on segment 9 and an apical ring on 10, the latter sending a slight prolongation along the dorsal carina. There are many variations of this pattern but the differences appear to be purely individual, not even racial characters.

Anal appendages dull sandy yellow. Superior truncate, as long as segments 9 and 10 taken together. In profile they slope gently backwards and downwards and then rather abruptly downwards, the apices even turning finally a little forwards. Seen from above they taper evenly to the apex and are closely apposed throughout their entire length.

Inferior much shorter, only one third the length of superiors which they resemble only in colour. Cleft deeply into two closely contiguous branches which curve at first abruptly down and then as abruptly up again, the apices, finally directed straight back at a right angle to the part immediately in rear.

Genitalia. Very similar to that of *M. cognatus*; lamina pale yellow, very shallow, broadly notched; inner hamules long and narrow, slightly convergent, the apices ending in a short sharp and slightly turned out hook, black; outer hamules much longer and stouter, broadish at base but rapidly tapering to a point turning directly in to nearly meet at their apices, each bearing on the inner side, a short distance below the apex a short robust spine, black, yellow at the base. Lobe deeply excavate, hood-shaped, its apex strongly indented, directed almost straight back, black.

Female: Abdomen 31-36 mm. Hindwing 24-27 mm. (Poona and Coorg). Closely resembles the male except for shape of abdomen which is of even width throughout, much stouter and laterally compressed, no dilatations on the 8th and 9th segments.

As a rule females are much paler coloured than males and less marked with brown or black. The lateral prolongations of black extend on to the 2nd segment, segments 8 and 9 are deep black and unmarked. In some specimens however the abdominal markings are much restricted and 8, 9 and 10 are entirely yellow. Segments 3 to 6, ventral to the lateral black stripes are pure shining silvery white, a colour rarely met with in other members of the genus. Occiput bearing four spines on either side of the middle line, very evenly disposed in all specimens I have examined. (Laidlaw states that they are entirely absent in one of my Poona female specimens). Wings palely enfumed or saffronated at the base and even more faintly along the costal margin; costa and many of the nervures, especially the nodal, light yellow; nodal index :— $\frac{6\text{-}13 \mid 12\text{-}5}{6\text{-}9 \mid 9\text{-}6}$, $\frac{7\text{-}14 \mid 16\text{-}8}{8\text{-}10 \mid 10\text{-}8}$.

Hab. Breeds both in still and running waters; in Poona and Coorg it deposits its eggs in shallows either at the edge of a sandy beach or over ripples flowing over a gravelly bottom. The males await them here, settled on the sandy foreshore where by reason of their colour they are well nigh invisible. Occasionally they rise and patrol backwards and forwards over the shallow ripples, a favourite spot to find them. In Coorg, at Hoskoti, I found quite a number of tenerals emerging in a dense reedy swamp and can only conjecture that ova had been deposited in a tiny brook with sandy bottom which flowed into the marsh. The site was quite unusual and may have been forced on the females by the extraordinary swollen state of the rivers which in 1923 overflowed their banks and flooded large areas throughout Coorg. Larvae may possibly have been swept from the rivers and left stranded in such marshy retreats. The following is a description of the larva :—Length 25mm., of abdomen 17mm., of hind femora 5mm. Cylindrical, head moderately large; antennae of four segments, clubbed, the last segment very minute. Mask very broad, almost square, the base a little constricted, its outer surface coated with short hairs, mid-lobe straight not projecting, fringed with fine bristles, lateral lobe furnished with a long moveable hook, somewhat squat, saw-shaped, its inner border with a row of blunt, molar-like teeth. Abdomen tapering gradually to the end, 10th segment short, not hollowed out above and not furnished with spines. All segments except the 9th and 10th furnished with a blunt middorsal spine. Legs very short, femora fringed with long coarse hairs.

The larva thus differs strikingly from that of *L. nilgriensis* by its narrow and cylindrical shape and by the clubbed antennae.

M. lineatus is a very wary and shy insect and somewhat difficult to catch. Occurs almost throughout the year but is most common from September to November. Found throughout India, I have specimens from Burma. Ceylon

Bengal, Dehra Dun, Poona, Bangalore and Khandala in the Deccan, Madras, Palghat (Malabar), Trichinopoly, Coorg and the Nilgiris.

Mesogomphus grammicus (Ramb.)
Gombhus grammicus Ramb., Ins. Névrop. p. 164 (1842) ;
Onychogomphus grammicus Selys. Bull. Acad. Belg. XXI (2) p. 35 (1854) ; id. Mon. Gomph. p. 45 (1857) ; Will. Proc. U. S. Nat. Hist. Mus. Vol. XXXIII, p. 309 (1907) ; Laid. Rec. Ind. Mus. Vol. XXIV, pp. 371 and 403 (1922).

Male. Abdomen 33-39 mm. Hindwing 29-30 mm.

Head. Eyes bottle green: labium yellowish ; labrum, face and frons sandy yellow, a fine black line below frons, another between the ante-and post-clypeus and an equally fine line at base of labrum. Base of frons, vertex and occiput black, vesicle yellowish, as also back of occiput. Behind eyes bright yellow, bordered with glossy black above.

Prothorax black with the posterior lobe, 2 small points just in front of it, a narrow anterior collar and the sides yellow.

Thorax yellow marked with black as follows :—two dorsal bands converging above, widely divergent below, markedly convex towards one another, (the middorsal carina and collar below are yellow and confluent, the former tapering into the latter), a humeral stripe on each side connecting up with the dorsal bands above and below, so as to enclose an oval spot of the ground colour, a posthumeral stripe connected with the humeral at its upper part only. Laterally both sutures finely black. Tergum spotted with yellow.

Legs yellow, femora marked with black or brownish black, the extreme distal end of outer side of hind, the distal half of outer side of middle, and the whole length of outer side of front pair ; tibiæ narrowly yellow on extensor surface.

Wings hyaline, palely saffronated, costa yellow; pterostigma yellow between black nervures, over 5 cells, 4 mm. long, braced ; 1 cubital nervure to all wings ; nodal index $\frac{9\text{-}16}{9\text{-}10}\Big|\frac{14\text{-}9}{10\text{-}9}$; 3 to 4 rows of postanal cells in hindwing ; no vestige of a loop ; 2 rows of postanal cells in forewing ; membrane almost obsolete.

Abdomen tumid at base, cylindrical and slender as far as segment 8, the latter and 9 dilated, 10 very small. Black and yellow as follows :—segment 1 yellow with a basal black spot on each side separated by the dorsal carina, 2 with a trilobed yellow dorsal band tapering apicad and lying between narrow black stripes, sides broadly yellow, 3 to 6 yellow with broad black apical rings and a median spot on the jugal suture tapering laterally, basad and apicad. On segments 4 to 6 the apical ring sends a prolongation forwards on either side which meets the jugal spot and encloses a yellow subdorsal spot, 7 to 10 ochreous or reddish yellow, basal articulations finely black.

Anal appendages yellow, superior as long as segments 9 and 10 taken together, subcylindrical, tapering apicad; where they curve downward. Apices flattened plate-like, slightly bifid. Inferior appendage shorter, broad and flat at base, curling abruptly up in its basal half; where it bifurcates into two slender contiguous truncate branches.

Female. Abdomen 37 mm. Hindwing 30 mm.

Similar to male except for sexual differences in shape. Abdomen differs slightly in colouring as follows :—the middorsal band on segment 2, the jugal spots are more restricted and not connected to apical rings on segments 4 to 6. Segment 7 has a diffuse apical dorsal spot tapering basad, 8 to 10 are reddish yellow and the sides of 8 and 9 are only slightly dilated.

Anal appendages short, conical, pointed, yellow.

Hind femora armed with a row of rather widely spaced, robust, gradually lengthening spines, mid femora with similar but more closely set and smaller spines, black, both pairs with a close field of spines on inner side.

Distribution. Laidlaw records a male from Agra and I have examined a female taken at Pusa: 16. VII. 20, which is quite complete. (In Pusa Mus.)

Rambur's type is an incomplete female labelled " India, Stevens." Type and paratypes in Selysian collection, paratypes in Indian Museum and Pusa collections. The insect is apparently very rare and confined to Central and North India.

Mesogomphus lindgreni sp. nov.

Male : Abdomen with appendages 39 mm. Hindwing 29 mm.

Head: Labium whitish green ; labrum greenish yellow, broadly black at the base ; mandibles similarly coloured ; anteclypeus and postclypeus greenish yellow, the latter clouded with black on either side of the middle line ; frons greenish yellow with a streak of black along its crest and the base above broadly black ; vertex black ; occiput very dark brown, *its border bearing no spines,* entirely naked save for a few hairs at each end.

Prothorax black.

Thorax greenish yellow, black markings similar to those of *lineatus* but much more extensive, the antehumeral and humeral stripes coalesced and obliterating the ground colour between them save for a small upper spot, similarly the two lateral stripes coalescent, forming one broad black stripe and leaving a mere vestige of the ground colour above.

Wings evenly enfumed, *costa and pterostigma black* ; reticulation black ; 3 nervures between *Mi-iii* and *Miv* in the forewing, 1 or 2 in the hind ; discoidal field of even width till well beyond the node ; nodal index :— $\frac{8\text{-}13}{8\text{-}9}\Big|\frac{13\text{-}8}{9\text{-}8}$.

Legs black save for a spot of yellow behind the proximal end of each femora, coxæ and trochanters yellow.

Abdomen black marked with yellow as follows :—segment 1 entirely black save for a small postero-lateral spot, segment 2 with a broad line on the mid-dorsal carina and the sides including the oreillets, the black sending a prolongation down behind the latter structures as in the case of *lineatus,* segments 3 to 7 with the basal half yellow, the lateral border of this colour running obliquely from the mid-dorsum to reach the ventrum of each segment just proximal to the jugal suture, segment 8 with only a largish baso-lateral spot and a fine apical yellow annule, the large, lateral foliate dilatations with an apical spot of yellow, segment 9 with the lateral dilatations entirely yellow and an angulated spot on the ventro-lateral and baso-lateral border, segment 10 with a greenish yellow diamond shaped spot on the mid-dorsum, otherwise deep black.

Anal appendages black, very similar to those of *lineatus,* superior as long as the 9th and 10 segments taken together, exactly similar to those of *lineatus* as seen in profile, but seen from above there is a distinct linear gap between them for rather more than basal half. The apical portions closely apposed, the apposed surfaces quite flat, thus resembling a pair of closed forceps. Inferior appendages smaller than in *lineatus,* more curled on themselves and passing up between the superiors, thus enclosing a tiny round foramina.

Genitalia. Lamina shallow, more depressed than in *lineatus,* its border not curling outwards, black ; inner hamules more conical, broad at base and tapering to a terminal, hook ; outer hamules stout hooks, more robust than in *lineatus and without the subapical spine* ; lobe directed out at right angles to axis of body, more prominent, its outlet more closed in and less indented at the apex than in *lineatus,* black.

Hab. A single male taken by Mr. O. Lindgren, Turzum, Darjeeling Dist. Very easily distinguished from *M. lineatus,* to which it is very closely related, by the great extent of black markings, by the black costa and pterostigma, by the absence of spines on the occiput and by the lack of specialization of neuration between *Mi-iii* and *Miv,* by the genitalia (lamina black, stout hamules and projecting lobe) and lastly by the anal appendages. Female unknown.

I have much pleasure in naming this fine species after Mr. Oscar Lindgren.

Mesogomphus risi sp. nov.

Male (Female unknown). Abdomen with appendages 27 mm. Hindwing 26 mm.

Head. Labium pale yellow, middle lobe rather blackish ; labrum pale yellow, its base and lateral borders deep black ; anteclypeus and postclypeus pale yellow, the latter with a broad black bordering at its central third ; mandibles pale yellow ; frons deep black in front, bright, citron yellow above, its base deep black and sending a fine medial prolongation forwards in the sulcus to join the black on front of frons ; vertex and occiput black, the latter with a broad yellow stripe traversing it, fringed with whitish hairs and a few minute black spines.

Prothorax blackish brown, yellow on the sides.

Thorax black with bright citron yellow markings as follows :—a mesothoracic collar broken in the middle line, oblique pyriform dorsal spots, pointed below and not joining the mesothoracic collar, a minute humeral spot on each side above and a vestige of a stripe below separated from it but in the same straight line ; laterally a broad medial black stripe dividing up the sides into three areas of even width, two yellow and one black.

Legs black, anterior femora yellow on the inner side, hind femora with a row of very small, very closely-set, numerous black spines, mid femora with a row of much more robust, less closely-set, less numerous spines.

Wings (badly damaged and shrivelled) hyaline, costa finely yellow, reticulation and pterostigma black, the latter braced ; 2 nervures between *Mi-iii* and *Miv* in the forewing, only one in the hind ; discoidal field of even width to beyond the level of node ; nodal index :— $\dfrac{7\text{-}12}{7\text{-}\ 9}\Big|\dfrac{13\text{-}6}{9\text{-}6}$.

Abdomen shaped as in *lineatus* but much shorter, jet black marked vividly with bright yellow rings, segment 1 with the apico-lateral border yellow, segment 2 with a middorsal stripe expanding apically but not quite meeting the apex of segment, its ventro-lateral borders rather broadly yellow, segments 3 to 7 with the basal halves yellow, this colour running obliquely from the middorsal carina to meet the ventral border just proximal to the jugal suture, segments 8 and 9 with only the foliate dilations bright yellow, 10 black with a small middorsal subapical spot.

Anal appendages black, the superior turning to yellow near the base on the outer side ; very similar in shape to those of *lineatus.* Superior as long as segments 9 and 10 taken together, rather straighter, the apex curled more abruptly and the final point directed back towards the abdomen ; seen from above separated in rather more than the basal half, the ends closely apposed. Inferior rather more than one third as long, rather less curled and the apex longer than in *lineatus.*

Genitalia. Lamina very shallow, very depressed, border barely concave, yellow ; inner hamules comparatively short, broad at base and rapidly tapering to a point, black ; outer hamules very long, almost twice the length of inner, very robust, their ends converging and curled in a very robust spine just below the apex on its inner side (much more easily seen than in *lineatus*), black ; lobe very similar to *M. lindgreni,* black directed somewhat outwards, deeply indented at apex outlet squarish but not nearly so deep as in *lindgreni.*

Hab. A single male from Burma, Kalaw, S. Shan States taken by Mr. G. Dingavan. The species is very distinct from others by its very small size (the smallest species of the genus) and by its brightly contrasted markings, by its black pterostigma, etc. I have named the species after Dr. Ris in recognition of his work on the genus.

Genus—ONYCHOGOMPHUS (Selys 1854, restrict).

(=Genus—ONYCHOGOMPHUS groups—GEOMETRICUS, UNCATUS, FORCIPATUS, AND CERASTES Selys.)

Lindenia De Haan, Bijd, Nat Wetensch i. (2) p. 47 (1826); Hoev. op. cit. 111 p. 333 (1828).

Diastatomma, p., Burm. Handb. Ent. ii. p. 831 (1839); Charp. Lib. Eur. p. 15 (1840.)

Onychogomphus, Selys, Bull, Acad. Belg. xxi. (2) p. 30 (1854); Mon. Gomph. p. 15 (1857).

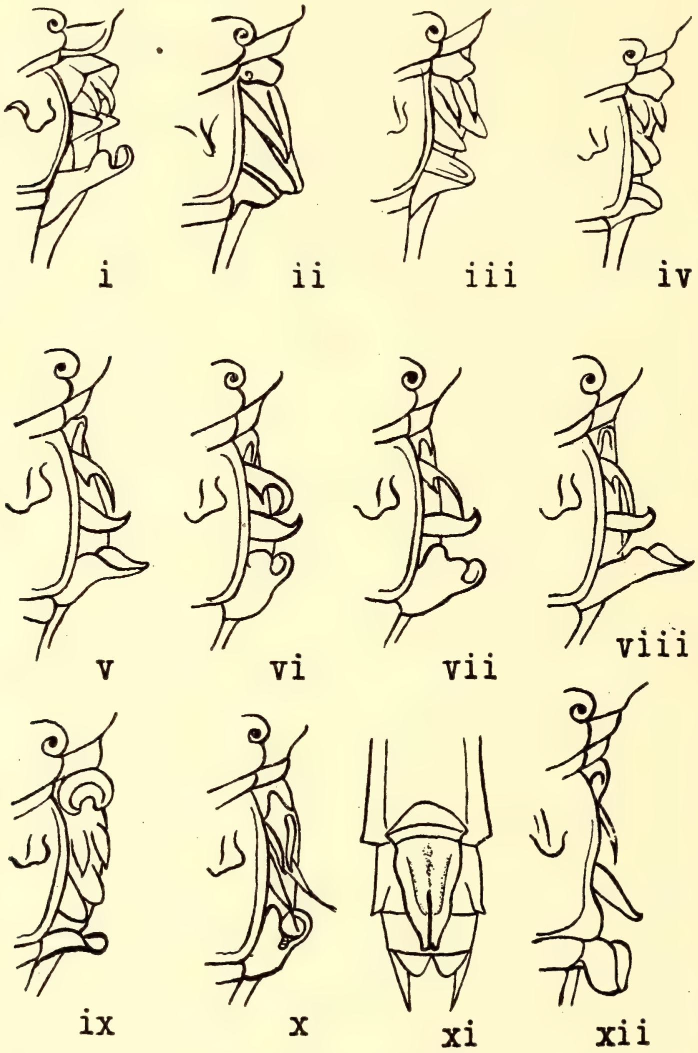
Lindenia, Kirby, Cat. Odon p. 57 (1890).

Onychogomphus, Will Proc. U.S. Nat. Hist. Vol. XXXIII, pp, 308-315 (1908); Laid. (Sections 1, III, and V,) Rec. Ind. Mus. Vol. XXIV, p. 402 (1922).

Moderately large insects with ground colouring bright yellow marked with black (or rarely, black marked with yellow); pterostigma large, but not as long as one fourth the distance between node and distal end of pterostigma; discoidal field in forewing narrow, only beginning to dilate at or after the level of node; anal loop very small, consisting of the first anal cell which is divided into two cells; 2 or 3 cross nervures between *Mi-iii* and *Miv* in forewing, only 1 in the hind; legs short, extending to the posterior border of thorax when apposed; abdominal segments 8 and 9 or 9 only a little dilated, no foliate processes as in *Mesogomphus.* Anal appendages of equal length, or the inferior slightly shorter than the superiors, usually about as long as the two last segments of abdomen taken together, superiors only slightly separated, parallel, inferior deeply cleft into two contiguous branches (in *O. williamsoni* the inferior appendage is abnormal and has divaricate branches); genitalia very similar in all species, lamina depressed, inner hamules very fine hooks of variable length, usually rather long and with a fine outturned point, converging gently on each other, external hamules more robust and relatively shorter, ending in a robust point, lobe projecting, funnel or bottle shaped (in *O. duaricus and striatus* it is rather broader and more depressed); vulvar scale very similar to that of *Mesogomphus* (except in *O.M-flavum* in which it is abnormally prolonged as far as 10th segment).

Larvae unknown. Genotype *O. forcipatus* Linn.

The genus as restricted here, contains a number of species whose position in the genus is very doubtful. No less than three species are known from females only and a fourth from two incomplete males, so that we are entirely ignorant of the character of the anal appendages of these, a very serious disadvantage when dealing with the genus. A fifth species described by Mr. Williamson has the inferior appendage divaricate, a character quite unique in the genus and therefore throwing some doubt as to its correct placing. *O. circularis* Selys has the superior appendages strongly curved circle-wise in the horizontal plane, very much as in genus *Heliogomphus* to which it may possibly belong. *O. modestus* differs from all others by its general black colouring and small size (equal to that of *Microgomphus*). Selys considered it as related to *O. saundersi* but it is difficult to see on what grounds as the size is one third smaller and the genitalia are quite different. Laidlaw basing his opinion on the great extent of black colouring and the shape of the anal appendages which compare favourably with those of *acinaces,* thinks that it may belong to group *biforceps* (*Lamellogomphus*), its very small size and the vesiculated genital lobe seem however to bar it from that group. Nor are we at all helped by venational characters, as Selys has given us no data to go upon, we are thus left with only the character of the markings to base our diagnoses on.



Explanation of Fig. 2.

Latero-ventral view of genitalia of :—i. *Heterogomphus hannyngtoni* ii. *Gomphidia fletcheri,* iii. *Gomphidia kodaguensis,* iv. *Gomphidia williamsoni,* v. *Oychogomphus, M-flavum,* vi. *Onychogomphus striatus,* vii. *Onychogomphus duaricus,* viii. *Onychogomphus dingavani,* ix. *Ictinus rapax,* x. *Lamellogomphus inglisi,* xii. *Mesogomphus lineatus,* xi. Vulvar scale, ventral view, of female of *Onychogomphus M-flavum.*

The female described by Laidlaw from Kumaon is undoubtedly *bistrigatus.* I have a male which compares as closely with this specimen as it does with the Selysian description in the Monograph of the type female of *bistrigatus.* Laidlaw has evidently overlooked in this description, the mention of a character on which he lays so much stress, *viz.*, the yellow neuration at the base of the wings. This character is strongly developed in the male mentioned above. The confusion which has arisen between the descriptions of *M-flavum* and *bistrigatus* has already been correctly interpreted by Williamson and Laidlaw, it is unfortunate that Selys did not give us the character of the vulvar scale in the adult female mentioned in the Monograph and that the end of the abdomen is missing from the Vienna Museum specimen, the shape of the organ in *M-flavum* is so characteristic that a knowledge of these points would have obviated any error.

The male from Kallar mentioned by myself in the Records, Indian Museum, l.c., differs rather more from the female of *bistrigatus,* than does the male mentioned above, and the neuration is black. Moreover its genital lobe varies considerably from all other members of the genus except *duaricus* so that I have described it below as a new species under the name of *striatus.*

Onychogomphus bistrigatus Selys, (*Gomphus bistrigatus*) Bull. Acad. Belg. xxi (2), p. 31 (1854); Mon Gomph. p. 22 (1857); Will. l. p. 309 (1908); Laid. l.c. p. 410 (1922), id. ibid. (*Onychogomphus sp.*) pp. 411-412.

Male: Abdomen 36+3 mm. Hindwing 31 mm.

Head. Labium pale whitish yellow; labrum yellow very finely margined with black anteriorly and at the base; clypeus, base of mandibles and frons yellow, a fine black line between the frons and post-clypeus incomplete laterally and sending two fine points down on either side the middle line; base of frons narrowly black with but the slightest prolongation in the middle line; vertex black, a small spot of yellow between the posterior ocelli; occiput slightly convex, yellow with the postero-lateral angles black, fringed with yellow hairs; behind occiput and eyes yellow, a narrow black line margining the latter above.

Prothorax black, its anterior and posterior borders narrowly and two fine approximated points yellow.

Thorax black on dorsum marked with yellow as follows:—the median part of the dorsal carina narrowly, a mesothoracic collar slightly interrupted in the middle line, oblique antehumeral stripes joined to the mesothoracic collar, complete humeral stripes slightly constricted just below their upper end, laterally yellow with two fine black lines mapping out the sutures.

Legs yellow, the anterior femora broadly black on the outer side, the middle with a fine black line and the hind pair with but a vestige of same on outer side; tibiæ black on the flexor surface, femora armed with a row of robust short, closely-set black spines and a single larger one at the distal end.

Wings hyaline with a greenish yellow tinge, neuration black but a large number of cross-nervures proximal to the node and on fore-part of wings bright yellow. Pterostigma dark brown, well-braced, over 3-4 cells; costa to half way over stigma pale yellow; nodal index:— $\frac{10\text{-}13 \mid 14\text{-}9}{8\text{-}10 \mid 10\text{-}10}$; 2 cross nervures between *Mi-iii* and *Miv* in forewing, only 1 in the hind, first postanal cell undivided in both hindwings, (but this is probably an aberration as the network is very irregular).

Abdomen black and yellow, segment 1 with a quadrate subdorsal black spot not reaching the apex of segment; 2 with broad subdorsal black stripes barely reaching the apical border and enclosing a dorsal lobed spot of yellow, a tongue of black running down behind each auricle; 3 yellow with a broad black stripe on each side falling well short of the basal end of segment and coalescing beneath the ventrum, above a subbasal and subapical tongue of black running up over the dorsum almost coalescing over the carina and enclosing a medial spot of yellow; on 4 to 6 the same markings but here the black processes coalesce over the middorsal carina and the apical band extends right up to the apical border; 7 yellow with a black dorsal stripe, very broad at the apex of segment where it sends a tongue-like process back along sides of segment, tapering rapidly on the dorsum and extending to extreme basal end of segment; 8 to 10 yellow, broadly black on dorsum, the yellow however constricting the black on segment 10 so as to almost cut it in two at the apical border. Apical borders of last three segments finely black and bordered with black spines.

Anal appendages yellow, of nearly equal lengths, as long as last two abdominal segments taken together, the superiors separated but parallel, their apices broadly flattened (lancet-shaped), turned rather abruptly down and a little in; the inferior cleft nearly to its base into two closely contiguous branches, nearly straight, the apex turning up, bearing a robust blunt spine at the outer end of the middle third and another similar spine near the apex, both very prominent when appendages viewed in profile.

Genitalia: Lamina yellow, depressed, its border angulated outward so that it appears rather deeply cleft; inner hamules broad at base, deeply cleft into two branches, an outer short spine and an inner, long thin spine which is everted sinuously at its apex, seen from the front converging rapidly on each other, black; outer hamules very stout and short, yellow tipped with a blackish brown, robust, forwardly-directed spine; lobe funnel-shaped, with broad opening, pale yellow narrowly margined with black.

Female: Abdomen 39mm. Hindwing 31 to 34 mm.

Very similar to the male. A comparison of the male and two females reveals the following slight differences which are merely those of degree in extent of black markings, differences probably due to the varying age of specimens.

The type female does not appear to have a basal black line to the labrum, whilst on the other hand the specimen from Kumaon has no similar border anteriorly (both borderings in the male are however extremely narrow, the anterior barely visible with the unaided eye, so that these may have been overlooked in the descriptions of the females.) The occiput in the type female is bordered with a row of six tiny spines, which are absent in the Kumaon specimen.

Prothorax of type and the male similar but the two small dorsal spots absent in the Kumaon specimen.

Thorax and legs similar in all three specimens.

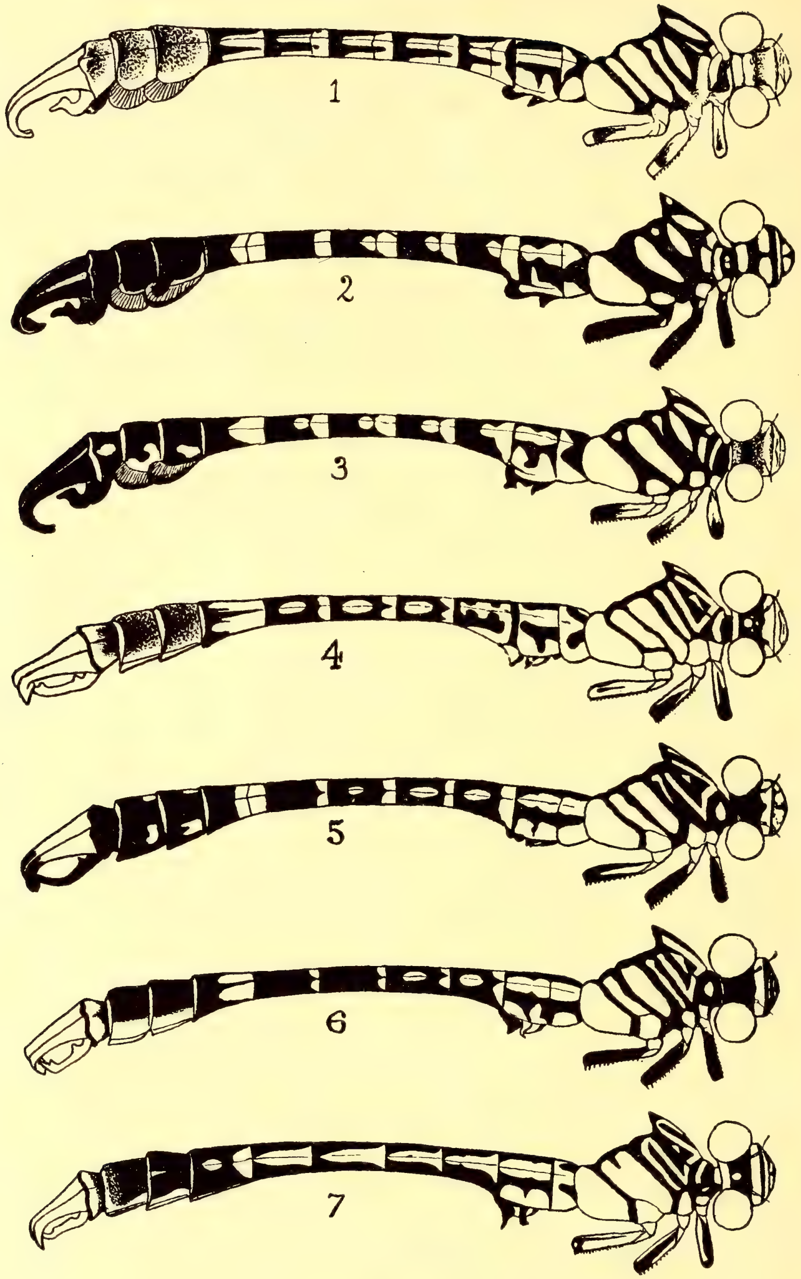
Abdomen. Segment 1 entirely yellow in the Kumaon specimen, marked with black in the type female and male, segment 2 variable, the subbasal black bands not meeting the apical border in the type, barely separated from it in the male and confluent with an articular black ring in the Kumaon female, segments 3 to 6 similar in the sexes (segments 4 to 6 missing in the Kumaon specimen) but the black extensions not quite meeting over the carina in the type, and 7 very similarly marked to the other segments.

Wings hyaline, many pale yellow nervures in both females similarly situated as in male; nodal index, 13-16 antenodal nervures in forewings, 10 in the hind, 10 postnodals in the forewings, 12 in the hind.

Anal appendages of female as long as segment 10, conical, pointed, separated by a conical protuberance of shorter length than appendages, yellow.

Vulvar scale short, about half the length of segment 9, deeply notched at apex into two subtriangular processes.

Hab. Type female in the Selysian collection from "India", cotype male in my own collection from Gopaldhara, Assam, collected by H. Stevens, 21 IX. 20. (Will be eventually deposited in the B.M.) Laidlaw's female is from Kumaon N.E. Himalayas.



Explanation of Plate II.

1. Dorso-lateral view of *Mesogomphus lineatus*, Male.
2. The same of *Mesogomphus risi*, Male.
3. The same of *Mesogomphus lindgreni*, Male.
4. The same of *Onychogomphus bistrigatus*, Male.
5. The same of *Onychogomphus duaricus*, Male.
6. The same of *Onychogomphus M-flavum* (Type Male).
7. The same of *Onychogomphus dingavani*, Male.

Onchogomphus striatus sp. nov.

Onychogomphus bistrigatus Fras. Rec. Ind. Mus. Vol. XXIV, p. 424 (1922).

Male: Abdomen 34+3 mm. Hindwing 28 mm.

Very similar to *bistrigatus*, differs as follows:—

Size slightly smaller; labrum more broadly bordered with black anteriorly; postclypeus entirely black at its centre, with a very large yellow spot on each side; vertex as for *bistrigatus*; occiput with its border quite straight and turned forward so that its posterior surface can be seen when the head is viewed from above, black with a narrow yellow border, fringed with long black hairs.

Prothorax similar but without the middorsal spots.

Thorax. Humeral stripes tapering away below to a point and not confluent with the yellow of thorax below. Lateral black lines on sutures rather thicker.

Wings with black retriculation, no pale yellow nervures present; nodal index:— $\frac{9\text{-}13 \mid 12\text{-}10}{9\text{-}9 \mid 10\text{-}10}$: 2 rows of cells between *Mi* and *Mia*; first postanal cell divided; pterostigma pale brown, rather weakly braced.

Legs as for *bistrigatus* but tibiæ black except at proximal ends.

Abdomen. Segment 1 black with a large lateral yellow spot, 2 with a narrow complete basal black ring and broad subbasal black stripes broadly confluent with the apical articular black ring, segments 3 to 6 with the yellow reduced to a complete but irregular basal ring and a median dorsal spot, 7 with its basal half yellow, 8 and 9 black with a large yellow spot on each side, 10 entirely black.

Anal appendages yellow, the inferior rather darker coloured and the superiors with a fine black line along the upper surface of the apical third. Almost exactly similar to those of *bistrigatus* but with the apices of superiors almost cylindrical, not flattened out lancet-wise as in that species.

Genitalia: Lamina blackish brown, its dorsum with a longitudinal keel, its border concave, neither everted nor angulated; inner hamules more shallowly notched, the inner branch not much longer than the outer and much shorter than in *bistrigatus*, its apex tipped with yellow; outer hamules dark brownish yellow, similar in shape to those of *bistrigatus*; lobe black, prominent but not markedly so, its border thickened, hollowed out medially, the extremities of the notch forming rounded bosses.

Hab. A single male from Kallar, Nilgiris, about 1,000 ft., May 1917. The species differs from *bistrigatus* by the greater extent of black markings and by the shape and colouring of the superior anal appendages and genitalia and lastly by the reticulation being entirely black.

Onychogomphus duaricus sp. nov.

Male: Abdomen 33·5 to 37·5+3·5 mm. Hindwing 31 mm.

Head. Labium pale whitish yellow; labrum greenish yellow, the base narrowly, the anterior border broadly black and sending a point up which may nearly or entirely cut the yellow in two by meeting the black of base (in the majority of *Gomphinae* we usually find a tongue of black running down from the base, the opposite condition found in this species is quite exceptional); anteclypeus and base of mandibles greenish yellow, postclypeus black with a small triangular spot of greenish yellow each side against the eyes; frons greenish yellow, its lower part in front black this confluent with the black of postclypeus, its base very finely black and a number of fine black points scattered about its crest; vertex and occiput black, border of latter nearly straight, not raised, fringed with long black hairs.

Prothorax black with a small lateral spot of yellow.

Thorax black on dorsum marked with yellow as follows:—a mesothoracic collar narrowly broken by the black dorsal carina which is narrowly yellow at its middle, antehumeral oblique stripes connected to the collar below, humeral stripes variable, clubbed above, tapering to a fine point below (In some specimens the tapered part is cut off from the upper part of stripe and in others it breaks up into a chain of fine points); laterally greenish yellow, the lateral sutures boldly mapped out in black, the anterior stripe connected to black of dorsum by a line descending from latter.

Legs black, hind femora with a broad yellow stripe on inner side, furnished with a row of closely-set, robust short black spines, the mid femora with a similar row.

Wings distinctly tinted with greenish yellow especially towards the base; costa finely yellow nearly as far as pterostigma which is deep brownish black, well-braced, over 5 cells; antenodal nervures and arc yellow; postanal cell divided; 2 to 3 rows of cells between *Mi* and *Mia* at level of outer end of stigma; nodal index $\frac{10\text{-}15}{11\text{-}12}\Big|\frac{17\text{-}10}{12\text{-}11}$, $\frac{12\text{-}16}{12\text{-}13}\Big|\frac{18\text{-}11}{12\text{-}11}$; 2 cross nervures between *Mi-iii* and *Miv* in forewing, only one in the hind; only 2 cells between *Cui* and *Cuii* at wing margin in hindwing.

Abdomen black marked with yellow as follows:—Segments 1 and 2 with a broad continuous dorsal lobed stripe, tapering at the apical end of segment 2 and bordered with a broad subdorsal band of black which is confluent with a narrow apical articular ring on segment 2, a short apical process of black occasionally runs along border of 1 and another behind the oriellets on segment 2. Ventral border of latter segment furnished with a row of small black spines. Segments 3 to 6 with clear yellow basal rings covering rather less than one fourth the length of segments, on 3 to 5 middorsal oval spots of yellow, almost obsolete on 5, absent entirely on 6, segment 7 with the basal half yellow, its crest finely black, 8 and 9 with lateral yellow spots, bifid posteriorly, 10 entirely black. Legs black except for stripe on innerside of first femora.

Anal appendages. Superior bright yellow, the apical third or more abruptly black, inferior black with the upper surface sometimes paler. Superior similar in shape to those of *bistrigatus*, parallel, converging at apices which are rather sharply turned down and compressed; inferior cleft nearly to the base, curved rather abruptly at their middles so that their apices lie between the superiors, a stout tooth on the upper border close to the base, *no apical tooth.*

Genitalia differing rather from that of other species except *striatus.* Lamina black, keeled only in its posterior half, depressed, but shallowly notched; inner and outer hamules of the same length, the inner long tapering black spines, the apices only slightly everted, the outer much stouter, directed straight out perpendicular to body axis, the apex curled and finally directed forward, yellow at base, black at apex; lobe rather prominent, borders tumid, similar in shape to *striatus.*

Female: Abdomen 40 mm. Hindwing 33 mm.

Very similar to the male, differing as follows:—Yellow on labrum not quite bisected by black; black at base of frons extends a short way into floor of sulcus; occiput black and similar to male in shape; yellow on middorsal carina meeting the mesothoracic collar which is uninterrupted; humeral stripe complete below and connected with the elbow formed by the junction of mesothoracic collar and antehumeral stripe; sides of segments 1 and 2 more broadly yellow, the black sub-dorsal bands narrower and with straight borders; no dorsal spots on segment 4, the basal yellow on segment 7 more restricted; spots on sides of 8 and 9 absent.

Anal appendages pale yellow, almost white, conical, pointed, rather longer than segment 10, the protuberance between them pale yellow.

Legs with all the femora striped on the inner sides with yellow, the spines on hind femora much less numerous, longer, more widely-spaced and more robust than in the male.

Wings with the greenish tinting more marked especially towards the base; 2 to 3 rows of cells between *Mi* and *Mia,* usually only 2 rows; nodal index $\frac{11\text{-}17 \mid 17\text{-}11}{10\text{-}12 \mid 13\text{-}11}$, $\frac{11\text{-}17 \mid 17\text{-}10}{12\text{-}12 \mid 12\text{-}11}$; 2 rows of cells in anal area of forewing.

Vulvar scale aborted, only perceptible as two rudimentary rounded shiny tubercles, the remnants of a bifid scale.

Hab. Hasimara, Duars, Bengal. Several pairs collected by Mr. H. V. O'Donel to whom I am indebted for this beautiful species. Type male and cotype female in the British Museum.

The following combination of characters will distinguish this species from all others:—the unusual distribution of black on the labrum, the black occiput, the wide space between *Mi* and *Mia,* the shape of the genitalia in both sexes, the striking colouration of the superior anal appendages and the presence of only one tooth on the inferiors.

Onychogomphus M-flavum Selys. Causeries Odonatologiques No. 7, Ann. Soc. Ent. Belg. pp. 163-181, 1894;

Onychogomphus bistrigatus, Mon Gomph. pp. 24, 392, (1857); *Gomphus bistrigatus* Bull. Acad. Belg. XXI (2), p. 46 (1854); *Onychogomphus M-flavum.* Will. l.c.p. 309; Laid. l. c. 410, 411.

Male: Abdomen 35+3 mm. Hindwing 30-33 mm.

First male: Head. Labium dirty yellow; labrum greenish yellow, very narrowly bordered with black at the base, more broadly along the anterior border, a narrow streak of black running from its centre, of even width, not quite reaching the black on anterior border; base of mandibles, anteclypeus and a narrow bordering on lower edge of postclypeus yellow, latter black with a large greenish yellow spot on each side; lower part of frons black, this confluent with the black of postclypeus, upper part and above greenish yellow its base narrowly black; vertex and occiput black but a broad streak of greenish yellow on posterior half of latter, its border slightly convex in the middle, and turned forward so that the hinder surface is easily visible when the head is viewed from above, back of eyes black, of occiput yellow.

Prothorax yellow with a large triangular spot of black on each side.

Thorax black on the dorsum marked with bright greenish yellow as follows:—a mesothoracic collar broken by the black of middorsal carina, which is itself bright yellow somewhat higher up; antehumeral oblique stripes confluent with the collar, complete humeral stripes constricted a little below the upper part; laterally greenish yellow, the sutures outlined rather finely in black and on the first suture showing two interruptions which cut off a small part of the line opposite the spiracle.

Legs black, the anterior femora yellow within, the mid femora similar but with a narrow interrupted streak on the outer side, hind femora with broad streaks of yellow on both sides and furnished with a row of short robust closely-set black spines.

Wings hyaline faintly tinged with greenish at extreme base; pterostigma dark brown margined heavily with black nervures (much paler in teneral specimens and black in very adult), over 4-5 cells, well-braced; nodal index:— $\frac{15\text{-}14 \mid 15\text{-}13}{15\text{-}12 \mid 13\text{-}14}$, $\frac{12\text{-}15 \mid 15\text{-}12}{13\text{-}11 \mid 11\text{-}13}$; 2 rows of cells in anal area of forewing; only 1 roll of cells between *Mi* and *Mia* except at extreme margin of wing; 2 cross nervures between *Mi-iii* and *Miv* in forewing, only 1 in hind; first postanal cell irregularly divided; costa finely yellow as far as stigma but this colour lost in very adult specimens.

Abdomen black marked with bright yellow, more ochreous towards the end segments, as follows:—segments 1 and 2 with a dorsal lobed stripe extending from base of 1 to apical border of 2 and separated from the yellow of sides by a moderately broad stripe of black which sends a stripe down behind the oreillets segment 3 has a complete basal ring prolonged both along the ventrum and dorsum and confluent on latter with a large irregularly angulated dorsal spot, on 4 to 6 the basal rings less extensive laterally and partially bisected by an invasion of the black along dorsal carina, the middorsal spots smaller, oval and isolated from the basal rings, segment 7 with the basal two thirds yellow, 8 with the lower half of the sides, 9 with only a clouding of black on dorsum, 10 ochreous its apical margin finely black. All segments from 3 to 10 with an apical ring of fine black spines.

Anal appendages golden yellow, the superior a little darker, very similar to those of *bistrigatus,* broad at base, cylindrical and tapering to apex which is rather more sharply angulated downwards and inwards and compressed; branches of inferior about two thirds the length of superior appendages, closely contiguous and parallel, the apical third curved up, a robust tooth on upper border near the base and a second near apex.

Genitalia: Lamina very depressed, its border much everted, arched and folded back on itself, dark brown; inner hamules of great length and very attenuated, converging, the outer branch also elongate, black; outer hamules broad. of about the same length, yellow with a robust apical spine; lobe black, projecting prominently like an open spout.

Second and type males.

Differing from the first described male by the much greater extent of black. Anteclypeus, vertex and occiput entirely black; no median short black stripe on labrum; prothorax almost entirely black; humeral stripe interrupted above in the second male, entire in the type; lateral lines of thorax complete; costa yellow in second male, black in the type; pterostigma blackish brown; yellow on sides of segment 2 nearly cut into two by a prolongation of the subdorsal black, completely cut into two in the type; medial spot on dorsum of segment 3 small and completely isolated, almost obsolete on 4 in the second male, completely so in type; only narrow basal lunules on segments 5 and 6; 7 with only its basal half yellow and this divided by a narrow black dorsal carina, 8 and 9 broadly reddish yellow on the sides, the minature lateral wings black, 10 reddish yellow finely margined with black along apical border.

Legs black, only the anterior femora marked with yellow within.

Female: Abdomen 39 mm. Hindwing 32-36 mm.

Very variable, differing not only from the males described above but also individually in the sex.

Labrum finely or broadly bordered with black which may be more extensive than the yellow; anteclypeus dark brown or light greenish yellow, postclypeus black marked with a small lateral yellow spot or else almost entirely greenish yellow marked only with a small quadrate black spot at the middle of its posterior border; the black stripe at base of frons and that bordering it below in front very narrow or very broad; vertex black or black marked with a small spot of yellow between the posterior ocelli; occiput brownish in the type, black with a small central spot of yellow or entirely bright yellow in others, its border almost straight and yellow behind as in male; humeral stripe complete or occasionally broken at its upper part, the first lateral line on thorax complete or widely interrupted in one specimen as in the male described above.

Legs very variable, black marked with a variable extent of yellow, the hind femora armed with a row of very robust, very widely-spaced, long black spines.

Abdomen very similar in all specimens examined and to the type male and cotype female, the black on segment 1 reduced to a mere subdorsal vestige or entirely wanting, segment 2 in two females examined, with a large lateral isolated black spot, on segments 3 to 6 the basal yellow very broadly confluent with the middorsal spots and extending almost to apical border of segments as a broad dorsal stripe; remaining segments as for male but the yellow very dark reddish or ochreous.

Anal appendages and protuberance between them rather dark yellow, short, conical.

Vulvar scale very highly specialized and differing from any other species of the genus, shaped like an acuminate leaf, very long, extending to the middle of segment 10, cleft for rather more than its apical half into two closely contiguous halves, reddish brown, black at apex, very thin when viewed in profile, its surface raised into two longitudinal folds.

Wings slightly enfumed; pterostigma dark brown or blackish, over $4\frac{1}{2}$-$5\frac{1}{2}$ cells; nodal index $\frac{11\text{-}16}{13\text{-}11}\Big|\frac{15\text{-}13}{11\text{-}11}$, $\frac{12\text{-}16}{14\text{-}12}\Big|\frac{15\text{-}13}{12\text{-}14}$, $\frac{13\text{-}17}{12\text{-}13}\Big|\frac{17\text{-}13}{13\text{-}13}$; reticulation as for male but in one female 2 rows of cells between *Mi* and *Mia* nearly as far as stigma; costa black in one female, yellow in another.

Hab. Gopaldhara, Assam, Darjeeling District. I am fortunate enough to possess two males and three females and have seen a few others all taken at the same time and place by Mr. H. Stevens. The remarkable shape of the female ovipositor leaves no doubt as to their correct identity, and it is only reasonable to presume that the males are related to them. At first sight it would appear that the first male differs so markedly from the second and type males that it cannot be conspecific but if we compare the three males with the females described above, we find all the variations met with in the former, reproduced in the latter.

The male and female described as *O. M-flavum* in the Rec. Ind. Mus. by Laidlaw, undoubtedly belong to that species, the differences between them and the type noted by the author being explained away similarly.

The female is easily distinguished from all others by its remarkable ovipositor but greater difficulties are met with in distinguishing the males. From *duaricus* the unicolourous superior appendage and inferior with two teeth will serve to distinguish it; from *bistrigatus* the all-black reticulation, the greater extent of yellow on segment 7 and the lobe of genitals matt black; from *striatus* the complete humeral stripe (tapering rapidly away in the latter), the much narrower lateral lines on sides of thorax and the shape of the apices of superior anal appendages and lastly the shape of the genital lobe.

Onychogomphus dingavani sp. nov.

Male: Abdomen 32+3 mm. Hindwing 28 mm. Pterostigma 3 mm.

Head. Labium palest yellow; labrum greenish yellow, its anterior border narrowly black and an obscure central black line not quite reaching its base; anteclypeus yellow, postclypeus black with a large greenish yellow spot on each side; frons greenish yellow margined below the front with black which is confluent with the black of postclypeus, its base broadly and evenly bordered with black; vertex black with a small spot of yellow between the posterior ocelli; occiput bright greenish yellow, broadly yellow behind, its border quite straight and fringed with long brownish hairs; eyes black behind.

Prothorax black with an anterior collar, the posterior lobe, a small duplicated spot on the dorsum and a linear one on the sides yellow.

Thorax black on dorsum marked with greenish yellow as follows:—a mesothoracic collar broadly interrupted by the black dorsal carina which is narrowly bright yellow a little above for about its middle third; antehumeral oblique stripes confluent with the collar, complete humeral stripes curling in above where they become confluent with the antehumeral stripes, but slightly disconnected from the yellow of thorax below.

Laterally greenish yellow with the remnants of an anterior lateral line on the upper part of the first lateral suture and a complete narrow black line mapping out the postero-lateral suture.

Legs yellow marked with black, the first and second pairs of femora entirely black on the outer side, the hind with only a narrow stripe not extending as far as base. Flexor surface of hind femora thickly covered with small but robust spines, the middle femora with a row of widely spaced, more robust, longer spines.

Wings faintly and diffusely tinged with greenish yellow; nodal index:— $\frac{11\text{-}14}{12\text{-}10}\Big|\frac{14\text{-}13}{10\text{-}12}$; only one row of cells between *Mi* and *Mia* to within two cells of wing margin; 2 rows of cells in anal area of forewings; first postanal cell in hindwings undivided; *Cui* and *Cuii* with a single row of cells between, to within 4 cells of wing margin; pterostigma well-braced, over 4-5 cells, dark brown; costa yellow as far as stigma as also are many of the cross nervures in fore part of wings, the antenodals, the arc and in spaces running out from it.

Abdomen black marked with yellow as follows:—segments 1 and 2 with broad subdorsal black stripes of even width enclosing a lobed dorsal stripe of yellow, sides of both segments broadly yellow including oreillets, a black articular ring on segment 2; segment 3 with a narrow basal ring confluent with a short ventral stripe and a broad dorsal stripe with crenulate borders which extends to the apical border; segments 4-6 similar but the basal rings limited below and no ventral stripes; 7 with the yellow extending apically along the dorsum for two thirds the length of segment and black for the same length along the sides, the ventrum yellow; 8 and 9 with the sides broadly and the apical border of 9 narrowly yellow, 10 with its basal fourth black, the rest yellow, 9 and 10 with a fine apical border of black fringed with minute spines.

Anal appendages yellow, the inferior only slightly shorter than the superiors. The latter broad at base, cylindrical and tapering to the apex which is evenly and strongly curled down, separated at base, converging at apices. Inferior deeply cleft into two closely contiguous branches, at first curling down and then running nearly horizontally to the apices which are rather abruptly curled up, passing between the ends of the superiors. A robust tooth on upper surface close to the apex, basal third cylindrical and then abruptly thickened to nearly as far as apical tooth (the thickening begins at the site of the basal tooth in *M-flavum* and is really a continuation of this tooth).

Genitalia: Lamina low, shaped like that of *M-flavum* deeply arched, brownish; inner hamules fine, divergent (this may be because the penis is erect between them), of great length, passing down between the outer hamules nearly as far as lobe; outer hamules robust, yellow at base, black at apex, perpendicular to the body axis, ending in a robust forwardly directed spine; lobe matt black, projecting prominently like the spout of a tea-pot.

Hab. A single male from Kalaw, S. Shan States, Burma, collected by Mr. G. Dingavan (in slightly damaged condition). *The humeral stripe confluent above with the antehumeral*, the shape of the inferior anal appendages and the genitalia will serve to distinguish this species from all others of the genus.

(*To be continued.*)

NOTE.

In Part XVII, Indian Dragonflies, the explanation of Plate I, page 680, has been wrongly given as the explanation of Plate II and the explanation of Plate II as that of Plate I, the order should be reversed.

H. S. Photo.

RIDGE IN NEPAL.
Below Kalo Pokhari. 15th April, 1912.

H. S. Photo.

KALO POKHARI.
Camp 10,160′. 15th April, 1912.

NOTES ON THE BIRDS OF THE SIKKIM HIMALAYAS.

By

HERBERT STEVENS, M.B.O.U.

Part III.

(*With* 3 *plates.*)

(*Continued from page* 740 *of this volume.*)

SUB-FAMILY—BRACHYPODINÆ.

94. The White-throated Bulbul. Criniger tephrogenys flaveolus (Gould).

Occurs at *low elevations* in the Tista Valley. Obtained up to 1,500.′ (G. E. Shaw). Nowhere does it reach the limit or anything approaching " seldom above 5,000′ " as recorded by Oates. It is strictly a plains Bulbul.

95. The Himalayan Black Bulbul. Microscelis psaroides psaroides (Vig.). " Kaki " Paharia.

Dr. Hartert has stated the reason for this change in the generic name *Hypsipetes* now *Microscelis* (Nov. Zool., vol. xxix, 1922, pp. 366-7). Numerous at *all elevations up to 10,000′ on the Outer Ranges.* Tonglo summit at 10,000′, 23-1-12*, a party of from twenty to thirty birds came to rest in a tree adjacent to the Rest House; they were very wild and only settled for a brief time. Observed around Singhik at 4,850′, 13-3-20*, in a party of six or thereabouts.

96. The Brown-eared Bulbul. Hemixus flavala flavala (Hodgs.).

More or less locally distributed. Occurs in the Rungbong Valley up to *5,000′.* Obtained in the Tista Valley up to 3,800′, (G. E. Shaw).

97. The Rufous-bellied Bulbul. Hemixus macclellandi macclellandi. (Hodgs.).

Common from 3,400′-6,000′ in the Rungbong Valley, and obtained in the Tista Valley from 3,900′-4,500′. (G. E. Shaw).

98. The Striated Green Bulbul. Alcurus striatus. (Blyth).

Locally distributed and fairly numerous both in the *Interior and on the Outer Ranges at elevations of from 4,700′-6,000′.* Obtained above Mangpu at 5,300′. (G. E. Shaw). Temi to Namchi at 6,100′ 15-3-20*, much in evidence. Occurs commonly at Gopaldhara from 4,700′ upwards, being strictly confined to forest.

99. The Bengal Red-vented Bulbul. Molpastes hæmorrhous bengalensis (Blyth).

Commonly distributed at all elevations up to 4,500′ at all events, but it is very doubtful if it approaches an elevation of 7,000′ as recorded by Oates. This Bulbul and the next species consort together during the cold weather at the bottom of the Rungbong Valley and are then partial to the berries of the " Panisajh " trees.

100. The White-cheeked Bulbul. Molpastes leucogenys. (Gray).

"Jharali", Paharia, used for all Bulbuls without discrimination.

Commonly occurs from *low elevations at 1,200′* in the Tista Valley (G. E. Shaw), and probably lower, up to *6,000′ on the Outer Ranges,* both in East Nepal and Sikkim. Observed around Shamdong at 2,600′, in the interior of Sikkim during February and March.

101. The Bengal Red-whiskered Bulbul. Otocompsa emeria emeria (L.).

In all probability does not occur much above Birik in the Tista Valley at *an elevation of 600′,* where I have observed this Bulbul. *Molpastes leucogeny* evidently takes its place on or about Tista Bridge and upwards.

102. The Black-crested Yellow Bulbul. Otocompsa flaviventris flaviventris (Tick.).

Widely distributed from *low levels up to 5,000′.* Obtained up to 3,000′ only in the Tista Valley. (G. E. Shaw).

103. The White-tailed Nuthatch. Sitta himalayensis Jard. & Selby.

Generally distributed at somewhat lower levels in the Interior of Sikkim than on the Outer Ranges. Locally migratory to some extent, descending the slopes of the mountains in the winter and ascending from the valleys with the advent of the hot weather. Observed below Gangtok at *3,100′* in early *March.* Singhik, 4,800′, 24-2-20. Tonglo summit at *10,000′,* a pair seen on several occasions in *January* accompanying parties of Cole-Tits,—*L. rufonuchalis beavani* and *L. dichrous.* Mai "Khola," East Nepal, 8,500′, 12-4-12, several seen this day. Tonglo, 9,000′, 26-5-12, a pair, ♂ obtained; where they are also to be found during the S. W. monsoon. Gopaldhara, occasionally noted around the bungalow at 4,720′ at times during the "the rains" or "cold weather," never more than a pair of birds acting in concert with *Minla, Pseudominla,* &c., 5,800′, ♂ ♀ 7-10-21. Obtained at elevations of from 5,500′-7,500′ above Mangpu. (G. E. Shaw.) Blanford met with it on the Cho La Range (August) at 11,000′ but met with no *Sitta* above 7,000′ in Northern Sikkim, which is also my experience in the winter.

104. The Cinnamon-bellied Nuthatch. Sitta castaneiventris castaneiventris Blyth.

Resident and generally distributed. Found at *all elevations up to 4,800′* around Gopaldhara, and obtained up to *3,800′* in the Tista Valley, below Mangpu. (G. E. Shaw.). 6,000′ as recorded by Jerdon and quoted by Oates is too great an extreme limit for Sikkim.

105. The Beautiful Nuthatch. Sitta formosa (Blyth).

The type locality is Darjiling and is thus recorded for Sikkim. Undoubtedly very rare and extremely locally distributed. I have failed to locate it. Evidently Macintosh was acquainted with it, as he quotes Senchal as being one of its haunts in his "Birds of Darjeeling." Represented in the Tring Museum by one specimen only *ex.* Elwes Coll., but well represented in the National Collection by specimens obtained in almost every month of the year.

106. The Velvet-fronted Blue Nuthatch. Sitta frontalis frontalis (Swainson).

A Plains Nuthatch. Obtained in the Tista Valley up to *an elevation of 2,500.* (G. E. Shaw). Nowhere approaches to an elevation of 5,000′ or higher as recorded by Oates for the Himalayas, at all events in Sikkim. This Nuthatch is distinguished from true *Sitta* by several striking structural characters and is placed in the genus *Callisitta* by Hellmayr ("Genera Avium", Wytsman.) It well might find its correct place in this last genus if numerous other genera are retained.

107. The Crow-billed Drongo. Dicrurus annectens annectens (Hodgs.).

Recorded for the lower levels of Nepal and Sikkim.

108. The Himalayan Black Drongo. Dicrurus macocercus albirictus (Hodgs.).

Recorded for 5,000′ or even higher in the Himalayas. I have no information respecting this Drongo. All my specimens of *Dicrurus* have proved to be the next species.

109. The Himalayan Grey-Drongo. Dicrurus leucophæus stevensi Stuart Baker.

Recorded for the Himalayas " found as high as 10,000′ ". Generally distributed at moderate elevations to higher limits. The common Drongo in the Darjeeling District. Occurs around Gopaldhara at 5,000′, as a breeding resident, also occurs plentifully in the Tista Valley at elevations of from 3,000′-3,750′. (G. E. Shaw), Thurbo, 4,500′, 10-5-15*. Four King Crows observed mobbing a pair of Owls (*Glaucidium cuculoides*).

110. The White-bellied Drongo. Dicrurus cærulescens (L.).

Recorded for the Himalayas up to about an elevation of 6,000′. I have no information respecting this Drongo. If it has any status in these hills, it is not likely to be overlooked, being a well-marked species. The series in the B. M. Coll. contains no specimen from the Sikkim Himalaya.

111. The Bronzed Drongo. Chaptia ænea ænea (Vieill.).

Generally distributed. Occurs up to 5,000′ at all events in the Rungbong Valley. Not obtained above 3,000′ in the Tista Valley. (G. E. Shaw).

Probably occurs much higher, though Gammie found it breeding only at 2,000′.

112. The Hair-crested Drongo. Chibia hottentotta hottentotta (L.).

Sparingly distributed at the bottom of the Rungbong Valley from 3,500′-3,700′, and when the " Falada" trees are in flower, comes up to the Bw. elevation of 4,720′, 26-27-10-15*, a pair, 11-9-20*, a pair, 17-9-21*, several in evidence, many even higher on occasions at 5,200′, 1-2-21*, noted hereabouts. As many as forty birds seen in the "simal" (*Bombax*) trees at Namsoo at 3,000′ on the 18-5-15*.′ Obtained up to an elevation of 1,900′ in the Tista Valley. (G. E. Shaw). Young birds ready to leave the nest by the end of June, or the first week in July ; a specific date being the 25-6-23, when two youngsters were brought in at Gopaldhara.

113. The Indian Lesser Racket-tailed Drongo. Bhringa remifer tectirostris Hodgs.

Confined to the hot, moist, deep valleys. Observed around Dikchu at 2,150′ in the interior of Sikkim, in February and March. 5,000′ as recorded by Oates is too great an extreme limit in general for Sikkim, though Gammie mentions it nesting at Rishap (Rashab) in the Tista Valley at 4,800′.

114. The Assam Racket-tailed Drongo. Dissemurus paradiseus grandis (Gould).

Extends up the Tista Valley to at least 1,000′ (G. E. Shaw), but probably not far into the interior. Absent around Dickchu at 2,150′, in February and March 1920.

115. The Nepal Tree-Creeper. Certhia familiaris nipalensis Blyth.

This Tree-Creeper is strictly sedentary, but on occasions descends to lower limits to some modified extent under stress of severe weather.

Recorded for 13,000′, Pine forests, in September, North Sikkim. (Blanford).

Generally distributed from 8,000′ to *12,000′*. Observed below Sookia Pokhari at *6,500′* ♂ ♀ 18-1-12.* Occurs on Tonglo and Sandakphu summits throughout the winter, when it is then partial to the dwarf birch trees on the bare mountain slopes, generally in pairs, accompanying a foraging party of Cole-Tits: *Parus ater æmodius, P. rufonuchallis beavani* and *L.d. dichrous*. Tonglo, 9,000′ to 10,074′, summit level, a series of three ♂ ♂, five ♀ ♀, collected in January 1912.

Karponang at 11,000′, in March 1917, only an occasional bird seen, and evidently far from common in the Pine forests during the winter.

Six specimens examined :

♂ Bill from feathers, at base 14; wing 68-69, av. 68·5.
♀ „ „ „ „ 11-12, av. 11·8 ; wing 65-66, av. 65·5.

Soft parts: Iris, brown ; bill, black on upper mandible, white on lower mandible ; tarsus, horny.

116. The Sikkim Tree-Creeper. Certhia discolor discolor Blyth. "Soolsooli", Paharia.

Commonly occurs in the *Rungbong Valley from 3,500′-6,000′* in the "cold weather," but seldom if ever observed in "the rains." Obtained in the Tista Valley around Mangpu at elevations of from 3,000′-4,500′. (G. E. Shaw). In the *interior observed at Shamdong at* 2,300′, 15-3-20. Apparently does not overlap with *C. familiaris nipalensis* in its zonal distribution. Gopaldhara, 5,800,′ ♂ 5-2-21. 5,000′, ♀ 16-2-18. 4,720′, 16-7-21*, a pair came into the compound in company with *Parus monticolus, Zosterops, Phylloscopus*, &c., 5800′, a single bird observed in the forest 13-5-23, was most probably the pair to a breeding bird.

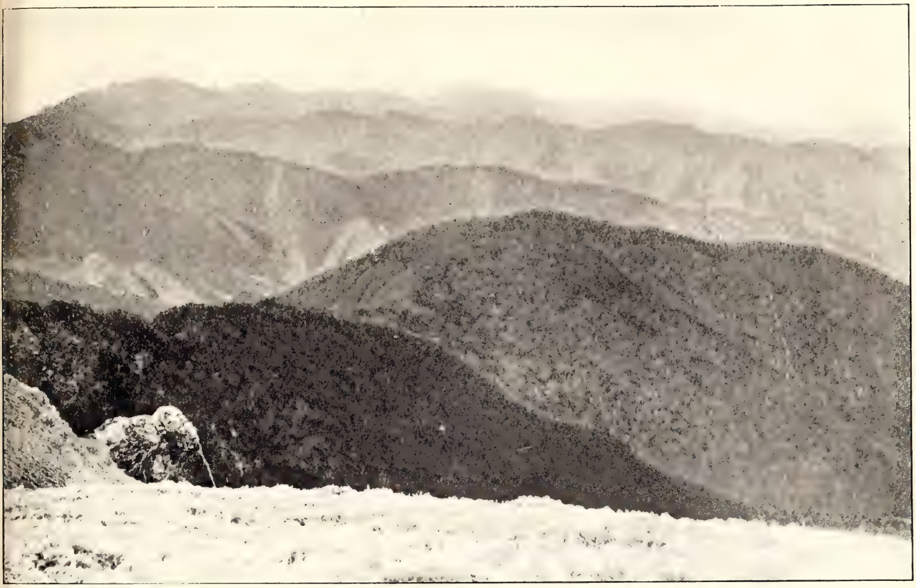
Eight specimens examined :

♂ Bill from feathers at base 14-15, av. 14·5; wing 67-70, av. 68·8.
♀ „ „ „ „ 12-13, „ 12.4; „ 64-67·5, „ 66-2.

Soft parts : Iris brown ; bill upper mandible dark horny, lower mandible pale horny, dark at tip, gape inside pale fleshy ; tarsus dark fleshy-horny.

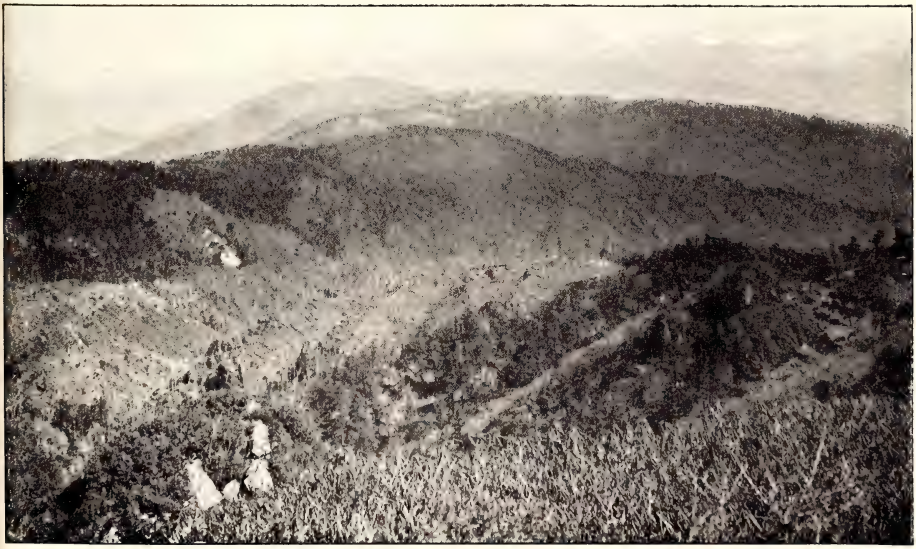
117. Stoliczka's Tree-Creeper. Certhia stoliczkæ Brooks.

Fairly common from *9,000′* to *10,000′ on the Singile La Ridge, January to May* ; specimens secured both in Nepal and Sikkim. Obtained as low as *6,500′, on the Semana-Mirik Ridge*, ♀ 7-2-18. Ghoom to Sookia Pokhari, 7,100′, 13-12-13,



H. S. Photo.

THE RIDGES OF EAST NEPAL.
Looking west from Phalut, February, 1912.



H. S. Photo.

"THE SNOWS" AND PINE FORESTS.
Abies webbiana, Silver Firs of Hooker.
From Sandakphu, March, 1912.

several observed along the forest road. Tonglo, 10,000′, ♂ 27-1-12. ♀ 28-1-12. ♂ 9-2-12. Kalo Pokhari, 10,160′, ♂ ♀ 19-4-12, ♀ 21-3-12. ♂ 23-5-12. Observed around Lachung at 8,800′ in February and March.

Five specimens examined:

♂ Bill from feathers at base 12; wing 74-76, av. 75.
♀ „ „ „ „ „ 12; „ 68-71, „ 69·5.

Soft parts: Iris brown; bill, upper mandible dark horny, lighter towards the tip, lower mandible pale horny, darkening towards the tip and edge in contact with upper mandible; tarsus pale horny.

Certhia himalayana himalayana Vig., is stated by Dresser, Hartert, Stuart Baker and others to have an extensive distribution throughout the Himalayas—Kashmir to Kansu in Western China. Oates strictly confined this typical form to the N. W. Himalayas—Gilgit, Almora, &c. No trace of this Tree-Creeper occurring in the Sikkim Himalaya has come to my knowledge. It is not represented in the Tring Museum from Sikkim, and notwithstanding the fact that there is one specimen from Darjeeling collected by one of the Marshalls and also one specimen from Nepal.—*ex* Hodgson Coll. in the B. M. series, for which information I am indebted to Mr. N.B. Kinnear—there surely must be an error in the locality on the label of the Darjeeling ? skin. Col. C. H. T. Marshall refers to its breeding habits at Murree. (Hume's Nests and Eggs, Oates, Vol. I, page 220.) The Sikkim Himalaya holds three well-defined species with fairly distinct zonal distribution limits. It appears to have a discontinuous distribution in the Eastern Himalayas.

If my surmise is not correct, it is surprising such a paucity of specimens from this area exist in representative collections.

118. The Wall-Creeper. Tichodroma muraria (L.).

The Wall-Creeper may be found *during the winter at diverse altitudes* in suitable localities, though it is rare and of uncertain occurrence.

Obtained at Mangpu, 3,800′, 21-11-19. (G.E. Shaw). Jalapahar, 7,500′, ♀ 13-2-20. Sandakphu, Nepal side of the Frontier at 11,800′, 7-3-12,* a single bird observed this morning, foraging on the face of a huge boulder, rather wild and difficult of approach once it was aware of my presence. Hereabouts, these rocks seemed most suitable haunts for Wall-Creepers, yet this was the only occasion I met with it. Lachung, circum. 9,000′, odd birds observed on the rocky slopes of the valley during February and March 1920. One observed in the stony bed of the La chu at 8,800′, 10-3-10*, had assumed the black throat associated with the adult in summer plumage. Three observed above Bhotan Ghat in the Raidak Gorge in January 1922, two of which were secured.

Three specimens examined:

♂ Bill from feathers at base 25; wing 109. ♂. Bill 24, damaged in the other example. Wing 102 in both cases. Compared with two females from the North frontier of Assam. Bill 25; wing 102-103. prove these measurements to be fairly constant. The spots on the outer primaries and tail vary in size and number individually in the adult, and the ochreous spot on the inner primaries is sometimes retained at maturity.

♀ (Assam). 2nd-5th primary, two spots, all white and large, 6th primary, one upper white spot. ♀ 2nd-4th, similar, 5th, merely an indication of the upper white spot, 6th, tinged ochreous, 7th, ochreous, 8th, merely an indication of an ochreous spot.

♂ (Bhotan Dooars). 2nd-5th, two spots all white and small, another ♀ from the same locality somewhat similar.

♀ (Darjeeling). 2nd-5th spots white, all lower ones small, upper spots large, 6th, upper spot only; ochreous lower half, remainder white. 7th-9th, single spots only, entirely ochreous.

119. Hume's Wedge-billed Wren. Sphenocichla humei (Mand.).

Recorded for Sikkim. Undoubtedly rare, with a restricted distribution. Specimens in the Tring Museum labelled Namchi, probably came from Tendong above this place.

120. The Nepal Wren. Troglodytes troglodytes nipalensis Blyth.

Resident on the *Singile La Ridge at elevations of from 9,000′-12,000′*, numerous at this extreme limit in winter. *In the interior* of Sikkim at Lachung, occurs at an elevation of *8,800′ in the valley during February and March.* Karponang, 10,000′ and above, on the slopes of the mountains during March. Once obtained amongst the rocks on Jalapahar at *7,500′* ♂ 14-2-20, which is food for speculation as the Senchal to Darjeeling Ridge is quite isolated from the main bulk of the higher ranges, and it would mean a lengthy flight if such was the case, to avoid the valleys for a sedentary resident. It frequents the rocky beds of mountain streams, fallen decaying trees in the pine forests, equally at home amongst the snow in inhospitable depths of the forest or the precincts of the flimsy dwellings of the shepherds. In the village of Lachung, it was partial to the crevices of the stone walls which demarcated the plots of rudely cultivated land. Tonglo, 9,000′-10,000′, 24th January to the 4th of February 1912, 3 ♂ ♂, 2 ♀ ♀ secured. Sandakphu to Saburkum 11,500′, ♂ 16-2-12. Kalo Pokhari, 10,160′ ♂ 4-3-12.

Karponang, 10,000′, ♂ 17-3-17. Lachung, 8,800′, ♀ 27-2-20, not observed in the winter beyond a three-mile limit above the village, along the path to Yumthang.

Eight specimens examined :

♂ Bill from feathers at base 10-11, av., 10·6 ; wing 51-53, av. 52·6.

♀ ,, ,, ,, ,, 10'5·11·5, av. 10·8 ; wing 50-53, av. 51·6.

The female average is brought up with the large dimensions of a Lachung specimen. Bill 11·5 ; wing, 53.

121. The Spotted Wren. Elachura formosa (Walden).

Recorded "high elevations in Sikkim." I anticipate this Wren will eventually be located along the foot-hills and probably in the bottoms of the valleys of the interior, at all events during the winter, with a similar habitat to *Pnœpyga pusilla.*

122. The Tailed Wren. Spelæornis caudata (Blyth).

Recorded for Sikkim at considerable altitudes. Obtained at Jore Pokhari, 7,400′. (C.M. Inglis). Represented in the B.M. Coll. by a fine series collected by Mandelli with nothing more definite in regard to the exact localities than "near Darjeeling."

123. The Slaty-bellied Shortwing. Tesia cyaniventer Hodgs.

Generally distributed in forested country with a sufficiency of undergrowth from the *plains level up to 6,000′*, and apparently not resident around Gopaldhara at 4,700′, as it has only been noticed hereabouts at the breeding season from the end of March or thereabouts and onwards.

Eleven specimens examined from the Eastern Himalayas.

♂ Bill from base 14-14·5, av. 14·3 ; wing 47·5-49, av. 48·9.

♀ ,, ,, ,, 13-13·5, av. 13·3 ; wing 44-48, av. 46·3.

One specimen, collected in the Plains of Upper Assam at Rungagora in the Dibrugarh District, ♂ 10-1-04, has the crown concolorous with the back and the whole of the underparts from the chin to the vent pale slaty-blue. This phase ? has always puzzled me, as I do not consider it referable to the male juvenile stage of this species; the bill, tarsus and hind claw are stronger than in any of the other previously measured specimens.

Bill from base 16; wing 49; tarsus 25; hind claw 7.

It is very near to *Tesia cyaniventris superciliaris*, La Touche, after comparison with the type.

" Very close to the female of typical *T. cyaniventris,* but with a much more pronounced and purer black eye-stripe and lores, and with a short, pure grey stripe just behind the eye, between the yellowish supercilium and the black eye-stripe. A bird from Manipur in the British Museum Collection is very similar, but lacks the post-orbital grey stripe and is paler below."

Ibis July 1923, pp. 369, 370. " On the Birds of South-East Yunnan, S. W. China." (S. D. La Touche, M. B. O. U.)

♂ Soft parts: (June.) Iris brown; bill upper mandible blackish-horny, lower mandible and inside gape, reddish-orange; tarsus, dark olivaceous; claws horny.

124. **The Chestnut-headed Shortwing. Tesia castaneocoronata castaneocoronata** (Burton).

This Shortwing seems to me to be entitled to generic rank, but as Dr. Hartert has shown, (Novitates Zoologicæ, Vol. XVII, 1920, page 480) *Oligura* cannot stand. Apart from coloration which may have no significance in the definition of genera; the remarkable bill of *Tesia cyaniventer* appears to be a sound structural character for generic distinction and congeneric with this species is *Pseudoxenicus superciliaris* (Bp.). Type Locality, Java, whereas *Tesia castaneocoronata* has a totally different, slender and narrrow bill; which was one of the reasons given by Oates for keeping them generically separated. It is found at *all elevations from the foot of the hills in " the cold weather, " up to 10,000′ or higher in summer.* Blanford records it from Northern Sikkim at elevations of from 7,000′-10,000′. Observed on the Singile La Ridge at Kalo Pokhari at 10,160′, in May. Mai (" Khola ") Valley, East Nepal, 8,000′ upwards, ♂ 9-4-12, ♂ 7-5-12. Bhotan Ghat, Raidak River, Eastern Dooars, ♀ ♀ 22-24-1-22, others seen. Gopaldhara, Rungbong Valley, 3,550′,22-3-11*, noted on several occasions afterwards, more in evidence than *T. cyaniventer.* It is more addicted to frequenting the ground than its former ally and hops about the rocks in like manner to a wren. 4,700,′ ♂ 29-10-16, 7-4-16* 4,800′, ♀ 1-11-18. 5,000′, ♀ 17-2-18. 5,900′, ♂ 17-2-18. Mangpu, 3,800′, 26-3-15*, in scrub-growth. Rashab, Tista Valley, 4,500′, 15-3-20*, in bamboo forest.

Eight specimens examined and compared with four Assam skins:

♂ Bill from feathers at base 9·5-10, av. 9·6; wing 47·5-50, av. 48·4.
♀ ,, ,, ,, ,, 10, av., 10; wing 46-48·5, av. 47·7.

These females show a tendency to have a slightly stronger bill, which is the reverse case in my specimens of *Tesia cyaniventer.*

125. **The Scaly breasted Wren. Pnœpyga squamata** (Gould).

Blanford records it from northern Sikkim at 9,000′. It occurs in limited numbers from *5,000′-10,000′ on the Outer Ranges* according to season. Obtained in the *Tista Valley at 3,000-′5,900′*, (G.E. Shaw). Resembles a small rodent as it searches the ground in quest of food, most fearless, as on occasions it may come up to one's feet; neither is it easily dislodged from the crevices in which it takes shelter when approached, in this respect is similar to *Troglodytes nipalensis.*

Six specimens examined:
♂ Bill from feathers at base 10-11, av. 10·8 ; wing 58-63, av. 61·5.
♀ „ „ „ „ 10-11, av. 10-5 ; wing 59·5-62. av. 60·8.

The tertiaries in five adults are tipped with fulvous as in *P. pusilla*, a character of no consequence in discriminating between the two species ; the difference in size being, however, quite sufficient for this purpose.

126. **The Brown Wren. Pnœpyga pusilla** Hodgs.

Sparingly distributed from the *base of the hills up to an elevation of 6,500′* or thereabouts ; there is an overlapping to some extent in the breeding range of both this wren and its near ally. Obtained on the Semana-Mirik Ridge at 6,250′, 18-2-18, and also on Tonglo (C. M. Inglis) at 10,000′, most likely a straggler, Gopaldhara, 4,700′, 28-2-21*. 5,500′, ♂ 14-4-21. Bhotan Ghat, Raidak River. Eastern Dooars, ♀ 20-1-22. Obtained at Mangpu at 3,600′, (G. E. Shaw).

Two specimens examined : ♂ Bill from feathers at base 11 ; wing 53.
♀ „ „ „ „ „ 9.5 ; wing 49.

In these two adults, "correctly" sexed, ♂ testes in advanced development ; the usual distinguishing character in colour between the two sexes is reversed : the whole of the lower plumage in the male being fulvous, while the female is in the pale phase, which is regarded as the normal coloration of the male. All specimens, if sexed with absolute certainty, will eventually help to solve this interesting problem.

127. **The Himalayan Goldcrest. Regulus regulus himalayensis** Jerd.

Sparingly distributed on the *Singile La Ridge during the winter at 10,000′. In the interior* of Sikkim occurs at this period of the year at *9,000′ in the bed of the valleys,* and though by no means numerous, is apt to be overlooked, or its identity mistaken if intermingled with *Phylloscopi.* Tonglo, 10,000′, Nepal side of the Frontier, ♂ ♂ ♀, 25-1-12, the only occasion on which the Goldcrest was observed, these three birds were keeping up a lively commotion during a bright afternoon amongst the flowers of a stunted tree (*Daphne cannabina*). Lachung, 9,500′, ♂ ♂ ♀, 7-3-20. secured out of a party of eight to ten individuals accompanied with Cole-Tits : *Parus ater œmodius* and *P. rufonuchalis beavani,* in light mixed tree-growth, Larch predominating, below the main belt of the Pine forests.

Five specimens examined :
♂ Bill from feathers at base 7-7·5, av. 7·3 ; wing 56-58, av. 57.
♀ „ „ „ „ „ 7, av. 7 ; wing 54-55, av. 54·5.

Soft parts : Iris brown ; bill black ; tarsus brownish-ochreous ; toes and claws paler ochreous.

128. **The Fire-cap. Cephalopyrus flammiceps** (Burton).

Evidently locally distributed and by no means numerous, if indeed not actually rare. Obtained on four occasions in the Tista Valley at elevations of from 3,400′-3,700′, 16-23-2-19, 3,850′, 23-2-18. (G. E. Shaw).

Rungpo, Tista Valley, 1,250′, 19-2-20*. A party of twelve to fifteen counted at rest on the naked branches of a shade ! tree near the road-side on the Sankokhola road. On their taking flight they were more like Munias or Finches. I observed them very carefully at close quarters under a powerful glass and could hardly have made any mistake. So far I have failed to meet with it around Gopaldhara, and it may only be confined to moderate elevations in the Tista Valley. It is represented from Sikkim in the B. M. Coll. by 3 ♂ ♂, February and March.

Acrocephalus agricola sub-sp. nov.
Acrocephalus stentorea sub-sp. nov.

H. S. Photo.

VALLEY IN NEPAL, below Phalut. February, 1912.

H. S. Photo.

TONGLO, near the summit level of 10,074′. January, 1912.
Haunts of *Urocissa flavirostris*, *Nucifraga hemispila*, *Trochalopterum affinis*, *Ixops nipalensis*, *Yuhina gularis*, *Fulvetta vinipecta*, *Phœnicurus schisticeps*, *P. frontalis*, *Perissospiza icteroides affinis*, *Pyrrhula erythrocephala*, *Carpodacus rhodochroa*, *Callacanthis burtoni*, &c., &c.

H. S. Photo.

MAI ("KHOLA") VALLEY, East Nepal, from Kalo Pokhari.
Rhododendrons in bloom. April, 1912.

In my "Notes on the Birds of Upper Assam," B. N. H. S. Vol. XXIII, page 247, I recorded the first mentioned Reed-Warbler under the typical form. The winter migrants to Assam have been considered to be the eastern race "*concinens*" (Swinh.). In recent years a breeding bird has been described from (1920-Kaghan) North-west India, *i.e.*, "*haringtoni*" Witherby.

I have made a further examination of my Assam skins and eggs, which has resulted in an interesting discovery that there are two races of *Acrocephalus* breeding on the "churs" of the Subansiri River in Upper Assam; the larger bird is a race of "*stentorea*" and the smaller bird is a race of "*agricola.*" Specimens obtained in January at Gogaldhubie, ♂ 10-1-05, wing, 60. Boduti, ♂ 13-1-11, wing, 57·5. In both specimens 1st primary, 12, "narrow." These birds are paler on the underside compared with specimens from Hessamara obtained in April which have a decided rufous tinge on the underside, ♂ 11-4-15, wing, 53, ♂ 9-4-05, wing, 49·5. 1st primary, 11-12·5 "wider" than in the two former specimens; these latter can only be breeding birds, the difference in the wing formula is significant. I expressed my surprise when, having noted this Reed-Warbler as particularly numerous in April, I failed to meet with it in December of the same year. This is not remarkable but at the time was not rightly understood as the birds were evidently absent from their breeding haunts in the winter. Undoubted *Acrocephalus* eggs have been laid aside during my long residence in the east and it is only recently that I have been able to verify my contention that breeding birds of two races of *Acrocephalus* did exist in the Plains of Upper Assam. Whilst my skins are deficient in number; seven clutches of eggs have been examined.

Dr. Hartert gives the wing measurement of "*concinens,*" as somewhat shorter than typical "*agricola*" which is stated ♂ ♀ 55-60·5, "*haringtoni*" ♂ 56-58, ♀ 54-58.

The habits of *A. agricola* are said to be "very aquatic." I only found this to be the case with the bird obtained in the "cold weather."

Contradictory data in respect to the habitat of this species and also *A. dumetorum* which also occurred during the winter puzzled me considerably. I found *A. stentorea* a terrible skulker but at the nesting time the birds might almost be said to breed in colonies as all my eggs came from a limited area.

My *cold-weather migrants* have the 2nd primary between the 6th and the 7th, which is the wing formula for *typical A. agricola,* whereas the 2nd is equal to the 10th in the breeding bird and in this character is nearest to *A. concinens.* Mr. E. C. Stuart Baker has described this race as *stevensi*†, and after comparing 60 eggs of *A. s. brunnescens*, av., 22·7×15·9, with the eggs of the "dark" breeding race of *stentorea* in Assam, which are darker, more brown and less green, 20 eggs average 19·6×15, has named this race *amyæ*, wing, 83, in honour of my wife. The type specimens of these two new *Acrocephali* have been presented to the British Museum.§

Soft parts in "*agricola agricola,*" (January): Iris olive-brown; bill upper mandible and tip of lower mandible blackish-horny, remainder horny-white; tarsus brownish-horny. "*agricola stevensi,*" (April): Iris olive-brown; bill upper mandible blackish-horny, commisure line pale, lower mandible horny, darker towards tip; tarsus, brownish-horny.

129. The Turkestan Grasshopper-Warbler. Locustella nævia straminea (Severtz.).

Recorded for Native Sikkim: a specimen having been procured in June which is an immature bird collected in 1876 and represents the Sikkim material in the National Collection.

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† Represented in the B. M. Coll. by other specimens from the Bramaputra "churs" collected by Godwin-Austen.

§ Descriptions in the Bulletin B.O.C. Vol. XLIII, No. CCLXXI, pp. 16 & 17.

130. The Spotted Bush-Warbler. Tribura thoracica (Blyth).

Mandelli is mentioned in Hume's "Nests and Eggs" as having obtained it on three occasions, breeding in July at Yendong ? (Tendong) and Gammie on one occasion near Rungbee in June at 5,000′, a specimen in the B. M. Coll., is dated 15-6-75, female snared on the nest and probably refers to this record. There are other six specimens collected in every month from February to June and one in November and also a single specimen from the Bhotan Dooars, February, 1876, all of which are Mandelli's skins. This material has furnished Oates with its status as a nesting species and occurring up to 9,000′. It has in recent years been obtained on Phalut in the summer. (C. M. Inglis).

131. The Brown Bush-Warbler. Tribura luteoventris (Hodgs.)

Recorded under *Tribura mandellii* for Sikkim (February to May). Represented in the B. M. Coll. by Hodgson's specimens from Nepal and Mandelli's specimens from the Bhotan Dooars and Native Sikkim, from which last area there is one, dated June 1874. Mr. C. M. Inglis has obtained it on Phalut in the summer and this was apparently the species I saw at Lachung at 9,000′ on the 28-2-20*, unfortunately none were secured out of the small party, of which an odd bird or two were noted on this single occasion, as they were on the move in and about some scanty vegetation, and could have hardly been *Suyas* at this elevation in the winter, although they appeared to be a sedentary species to the valley.

132. The Indian Tailor-bird. Orthotomus sutorius sutorius (Forst.).

At the foot of the hills, this Tailor-bird frequents light, open forest, but does not penetrate the forest depths. Resident up to 4,720′ in the Rungbong Valley, an odd pair or so frequent the compound of the Gopaldhara Bw. and may be seen either in winter or summer. Obtained around Mangpu at 3,600′, (G. E. Shaw) above the Tista Valley, where formerly Gammie obtained it. Gangtok at 5,800′ and lower, 21-2-20*, it was much in evidence to judge by its high-pitched note, yet not actually observed in the dense scrub-growth which it was frequenting. Gopaldhara, 4,500′, 28-5-23. Three fully fledged youngsters almost ready to leave the nest.

133. The Black-necked Tailor-bird. Orthotomus atrogualris (Temm.)

Its distribution is stated as Lower Ranges of the Himalayas from the Rangit River in Sikkim to the Dhansiri Valley, Assam. It is somewhat remarkable that all the specimens I have procured at the base of these hills have all been *O. sutorius* and I have singularly failed to meet with it anywhere along the foot-hills of the Eastern Himalayas. The only locality in Upper Assam where it occurred was above Margherita to the east, and Mr. E. C. Stuart Baker informs me it had a habitat distinct from *O. sutorius* being confined to the forest and not found in the open surroundings.

As I could only find the Dhansiri Valley specimen in the B. M. Collection, I requested Mr. N. B. Kinnear for information and he reports that this species is not represented from west of Assam. In view of this fact it certainly seems as if the recorded distribution will have to be altered and this Himalayan portion of its range eliminated, notwithstanding Mandelli is said to have obtained its nest and eggs near the Great Rangit River.

134. Franklin's Wren-Warbler. Franklinia gracilis (Frankl.).

Recorded as "ascending the Himalayas to considerable elevations, and specimens as having been collected at Darjiling and in Native Sikkim." I have no record of this Wren-Warbler in these hills, which commonly occurs at plains-levels. Mr. G. E. Shaw has obtained a *Franklinia* in the Tista Valley at elevations of from 2,000′-4,000′ which he puts down as *F. rufescens* and I observed at Gitingy, 1,100′. 12-2-14*, a party of eight to ten birds on the maidan above the Mahanuddi, which I considered were also this same species. I doubt very much if this bird or any other member of this genus ever "abandons its accustomed haunts on the approach of winter" as these birds are strictly sedentary. It is more likely that all the specimens that Oates went through, came from the valleys in Sikkim.

This remark has no reference to its distribution in the North-West Himalayas. This genus appears to be in an unsatisfactory state, both in regard to the characters, habitat and distribution of each species. My notes can only serve to draw attention to the difficulties with a view to the ultimate clearing up of several knotty points which seem to me obscure.

In the Bhotan Dooars, January 1922, there occurred two species of *Franklinia* in small parties occupying distinct habitats. The bird I regard as *F. gracilis* was only to be found in the more open country, frequenting scrub-growth in the dried-up beds of the river channels, outside of the heavy forest, about two miles south of Bhotan Ghat on the Raidak River, 29-1-22, ♂ Bill from base 14 wing 46. 29-1-22, ♀ Bill from base 13·5; wing 44.

Soft parts: Iris ochreous-brown; bill blackish-horny; tarsus ochreous-fleshly; claws, pale horny-black.

Coloration.—Upper surface dark rufous, the tail tipped with white; which character appears to be constant in this species, yet the bills in both these two specimens are stronger than any of the following birds from Assam which have been measured for comparison.

Upper Assam, Dibrugarh District, Margherita. (Base of the hills to the east). 23-11-03, ♀ Bill from base, 12; wing, 44. In coloration agrees with the two former specimens.

Rungagora, (Plains), 6-4-03, ♀ Bill from base 12; wing 42.
Rungagora, (Plains), 13-4-03, ♀ ,, ,, ,, 11·5; wing 43.
North Lakhimpur, Derpai, (Base of the hills to the west), 21-3-05, ♀ Bill from base 12; wing 42.

Coloration.—Upper surface a drab ashy, which is evidently the normal breeding plumage.

Dejoo, 15-6-04, ♂ Bill from base 12; wing 48·5.
Dejoo, 3-7-04, ♂ ,, ,, ,, 12·5; wing 48.
Dejoo, 16-7-04, ♂ ,, ,, ,, 12·5; wing 48.
Dejoo, 4-8-04, ♀ ,, ,, ,, 12; wing 45.

Coloration.—These four specimens are in worn breeding garb and show the well-defined ashy band on the breast.

Dejoo, 22-6-04, ♂ Juvenile, Bill from base 11; wing 43.
Dejoo, 12-8-04, ♀ ,, ,, ,, ,, 11·5; wing 44.

No use for comparison, being young birds which have not long left the nest.

Coloration.—Pale ashy-rufous on the upper surface, below, white on the throat to breast, pale rufous on the belly; "tips to tail white."

Dibrugarh District, Rungagora, 16-1-03, ♀, Bill from base 12; wing 42.
Rungagora, 16-1-03, ♀, Bill from base, 12; wing, 41.
North Lakhimpur, Dejoo, 28-11-10, ♀, Bill from base 12; wing 44.

Soft parts: Iris dark ochreous-yellow or dark straw-yellow.

Coloration.—These last three specimens have the upper surface tinged with rufous and to a less extent on the flanks; the tips to the tail are white. There is no dark head as is said to be present in *F. rufescens*, and though the tarsi are darker; the bills are not a defined black, as is said to be the case with *F. gracilis.* All the same I consider them to be in a stage of plumage which appears to be referable to this species.

135. Beavan's Wren-Warbler. Franklinia rufescens (Blyth).

Bhotan Ghat, Raidak River, Eastern Dooars, 26-1-22, ♂ ♂ Bill from base 13·5-14; wing 45-45·5. Obtained out of a small party in light undergrowth inside the fringe of the heavy forest at the base of the hills.

Soft parts: Iris pale brown; bill horny-black, edge of the lower mandible pale; tarsus fleshy-white; claws horny.

These specimens appear to be referable to *F. rufescens.* The crown is slightly darker than the back in one example, but with the exception of the fulvous tips to the tail approach in their bright rufous coloration the last three specimens of *F. gracilis.* Oates makes this species to have a smaller wing and a larger bill than *F. gracilis.* There is no appreciable difference in any of these characters as compared to the birds recorded under *F. gracilis* obtained three days later in a different habitat; apart from the head, the rest of the plumage shows a marked resemblance to *F. cinereocapilla.* Apparently *F. rufescens* is more of a hill-species, and appears to have a restricted range along the base of the hills, and *F. gracilis* while extending right up to the foot of the hills and possibly in the valleys shuns the well-wooded tracts. The exact distribution of the two species from correctly identified specimens is desirable.

136. Hodgson's Wren-Warbler. Franklinia cinereocapilla (Hodgs.)

This Wren-Warbler occurs sparingly at the bottom of the Rungbong Valley and below Gopaldhara at an elevation of from 3,500′-4,500′. One secured on the 20-12-11, and a pair observed at 3,550′ on the 4-7-16* in a thicket of reeds.

Blanford noted this species from Sikkim, yet Oates regarded his description as agreeing with *F. rufescens.* In my single specimen, I can detect no band behind the eye dark bluish-ashy, which colour is confined to the crown and nape, while the forehead is rufous, the supercilium is pale fulvous: broad in front of the eye, narrowing posteriorly over the ear-coverts which are dark fulvous; immediately in front of the eye is a dark spot on the lores. A minute description is very essential in the differentiation of the characters of the head in these *Franklinias.* The seasonal changes are difficult to follow, as the colour differences do not lend to easy description.

137. The Thick-billed Warbler. Phragomaticola ædon (Pall.)

Recorded for Sikkim, both British and Native. With the exception of two observations which are doubtful as no specimens were secured I have nothing on record respecting this Warbler which I knew as a cold weather visitor to the Plains of Upper Assam. Gopaldhara, 4,720′, 28-9-16*, a bird came to my Kitson moth lamp at night which seemed to be this species. Turzum, 4,800′ 18-1-12,* seen in "the tea" yet not near enough for a certain identification. Represented in the B. M. Coll. by three September and October specimens collected in 1876.

138. Tickell's Willow-Warbler. Phylloscopus affinis (Tick.).

Recorded "breeds high elevations in the Himalayas."

Only occurs *sparingly on migration at moderate elevations.* My observations have been extremely limited in regard to this Willow-Warbler.

Gopaldhara, 4,720′, 9-4-17′, one obtained. Chungthang to Toong at 4,500′, approx. elevation, 12-3-20*, a few noted in the valley at one locality only. Blanford met with it in the Lachen and Lachung Valleys at 8,000′-9,000′, but none before the 26th September. Recorded up to 15,200′ in Tibet. (Walton).

139. **The Smoky Willow-Warbler. Phylloscopus fuliginiventer** (Hodgs.).

Recorded for Sikkim " 14,000′, Blanford," and merely noted in the months of "February to June, Mandelli." I have failed to meet with this Willow-Warbler, which commonly occurred during "the cold weather" in the Plains of Upper Assam. Oates states this species to be resident and is evidently quoting Blanford in reference to the specimen obtained on Momay Samdong in rhododendron scrub.

140. **The Dusky Willow-Warbler. Phylloscopus fuscatus fuscatus** Blyth.

Recorded distribution "Found in Nepal"; probably in summer, and in Sikkim certainly at that season if we identify with this species the bird of which Jerdon found the nest at Darjiling in July. Hodgson's *Horornis fulviventris* is undoubtedly this species as proved by his types (No. 878) in the British Museum, and Jerdon identified his Darjiling specimen with *H. fulviventris*." It seems unaccountable that I have totally failed to locate a single specimen of this Willow-Warbler in these hills. I found it just as common in the Plains of the Eastern Dooars in "the cold weather," 1922, as it was at the same time of the year in the Plains of Upper Assam. They evidently either enter the plains to the east, or pass over the outlying hills during migration.

An examination of my material is detailed.

Upper Assam. (Plains).

Dibrugarh District.—
Rungagora.
♂ 25-1-03, wing 61·5; tail 46; 1st primary 20, (Dibru River), "very aquatic" noted on label.
♂ 15-10-03, wing 63; tail 45.5; 1st primary 20·5.
♂ 28-2-04, „ 59; „ 47; „ „ 21·5.
♂ no date, „ 63; „ 46; „ „ 22.
North Lakhimpur. Hessamara.
♂ 4-1-06, wing 63; tail 48; 1st primary 21.
Derpai.
♂ 14-3-06, wing 60; tail 48; 1st primary 21.
Dejoo.
♂ 15-3-10, „ 61; „ 48; „ „ 19·5.
Dibrugarh District—
Rungagora.
♀ 27-4-03, wing 59; tail 46; 1st primary 18
♀ 3-5-03, „ 58; „ 45; „ „ 18.
♀ 4-5-03, „ 56·5; „ 44; „ „ 18.
♀ 4-5-03, „ 56·5; „ —; „ „ 18.
Dejoo.
♀ 28-9-10, wing 56, tail 44; 1st primary 18.

Eastern Bengal. (Plains.)

Jalpaiguri District.—
Kumargram.
♂ 9-1-22, wing 63·5; tail 50; 1st primary 19.
♀ 9-1-22, „ 57; „ 45; „ „ 19.

These two latter specimens are more "dusky-olivaceous" than skins from Upper Assam with a "russet-olivaceous" tinge over the whole of the upper surface. Dr. Hartert gives the measurements of "*fuscata*": ♂ wing 60-66; ♀ 53-58, ♂ tail 53-58, ♀ 48-50; tarsus 20-22; culmen 12-13·5.

There appears to be more than one species amongst the above noted cold-season? specimens, though it is impossible to discriminate. I could never understand why this bird should remain in the plains of Upper Assam into May. I have recorded *fuscata homeyeri* (Dyb.) up to as late as the 22nd of May. It is well known that the birds of this humid climate have the tendency to exhibit a dark phase of plumage, and I shrewdly suspect a breeding Warbler will eventually turn up in the Plains. Against this conjecture is the fact that birds which have to accomplish a long journey to the far north invariably are late starters.

What was Oates's reason for stating "*fuliginiventris*" to be a resident species? a somewhat similarly coloured bird to "*homeyeri*," both of which occurred in a similar habitat in Upper Assam. It is to be presumed, he had seen specimens from the plains at even later dates than what I have recorded, unless his remark has no connection with the birds obtained in "the cold weather" at low elevations and only refers to Blanford's single specimen from 14,000′, which would still be a contradiction.

141. **The Grey-faced Willow-Warbler. Phylloscopus maculipennis** (Blyth.).

Obtained on the Outer Ranges at Gopaldhara at as low an elevation of *3,700′* 27-2-19, up to an altitude of *10,160′*, at Kalo Pokhari, 28-4-12. In the interior obtained at an elevation of 4,600′, around Singhik, 23-2-20, and around Lachung, at 8,900′, in the first week of March 1920, at which time it *ranged the highest of all the Willow-Warblers.* Commonly occurs around Gopaldhara at 4,700′ and upwards, during December and January. Obtained on the Ghoom to Sookia Pokhari Ridge at 7,000′, 19-1-12. On Jalapahar at 7,500′, 14-2-20. Numerous in the station of Darjeeling during January and February. A series collected in the Mai "Khola" in East Nepal at 9,000′ and below, during April 1912.

Thirteen specimens examined:

♂ Wing 48-51, av., 50. ♀ 45-48, av., 46·8.

142. **The Orange-barred Willow-Warbler. Phylloscopus pulcher** Blyth.

Recorded as a "resident where found and procured up to 13,000′, Cho La Range (Blanford), in Sikkim." Obtained as low as *3,900′* at Thurbo on the 2-4-11, and at 4,720′, at Gopaldhara, 8-3-21 in the Rungbong Valley. The former record is evidently a late straggler, as a few birds were also obtained at *10,160′* around Kalo Pokhari on the 12-4-12; but it was more numerous in the Mai "Khola" in East Nepal at lower elevations, 7,000′-10,000′, March and April 1912. Plentiful around Gopaldhara at 4,720′, November to February. *It can by no means be regarded as a resident as it performs an altitudinal movement.*

Fourteen specimens examined:

♂ Wing 54-61, av. 57·4. ♀ 55-58, av. 56.

143. **Pallas's Himalayan Willow-Warbler. Phylloscopus proregulus newtoni** (Gätke).

Occurs commonly around Gopaldhara from 3,500′, 30-1-19, up to 5,800′, 5-4-21. Obtained at all intermediate elevations, December to March, also obtained at the foot of the hills at Bhotan Ghat, Raidak River, Eastern Dooars, in January

1922. Mangpu at elevations of from 3,500′-4,000′, (G. E. Shaw). This Willow-Warbler is *confined to moderate elevations only as a breeding species.* Blanford records obtaining two specimens in Upper Sikkim at the end of September and the beginning of October.

Ten specimens examined : ♂ Wing 50-53, av. 51·7 ; ♀ 46-50, av. 48 ; one ♀ 5-4-21, actually has a wing of 55 ; this abnormal specimen has not been included. (Assam) skins for comparison. Seven examined : average, ♂ wing 54; ♀ 50·5.

Soft parts : Iris hazel-brown ; bill, upper mandible dusky, lower mandible ochreous, dark at tip ; tarsus dusky-ochreous ; soles ochreous.

144. The Crowned Willow-Warbler. Phylloscopus inornatus inornatus (Blyth).

A series of four ♂ ♂, ♀ ♀ collected at Bhotan Ghat on the Raidak River Eastern Dooars, at the foot of the hills, 20—26-1-22.

Nurbong, below Tindharia at 2,240′, ♂ 22-2-14. Thurbo, 3,900′, ♂ 2-4-11. 4,300′, ♀ ♀ 23—25-3-11. Gopaldhara, 3,700′, ♀ 27-2-18. 4,000′, ♀ 7-2-19. 4,720′, 3 ♀ ♀ 19—23-12-11, ♀ 14-12-19, ♀ 9-3-18, ♂ ♂ 22-3-16. 4,650′, ♂ 8-2-19. 4,720′, ♀ 9-3-18, give the zonal distribution of this Willow-Warbler during January, February and March ; some of the late records in March and April refer to stragglers in partial moult, exhibiting a drab phase of plumage. This Warbler is absent around Gopaldhara during "the rains" and probably retires to breed in the vast regions north, as I have failed to meet with it at higher altitudes. Obtained around Mangpu at elevations of from 3,500′-4,000′. (G.E. Shaw).

Eighteen specimens examined : ♂ wing, 56-60, av., 57.7; ♀ 51-57, av., 54.

The 1st primary varies in length and breadth measuring in 8 ♂ ♂, 11-15, av. 13·5, and in 11 ♀ ♀, 10-14·5, av. 11·8. There is also some individual variation in the depth of tone in coloration which seasonal change does not seem to account for ; also it may be remarked on the wing-bar across the greater coverts, the spots sometimes show as well-defined and deeper coloured blobs, seeming to indicate a sign of immaturity, as the lengthening of the inner feathers in growth causes this bar to assume a more oblique position. It is similarly the case with other members of the genus.

Soft parts : Iris hazel ; bill, upper mandible and tip of lower mandible dusky-yellow (dark olivaceous), deeper in yellow tone at base of lower mandible (pale olivaceous) ; tarsus and claws dark olivaceous (brownish-olivaceous) ; soles yellowish.

This Willow-Warbler is not recorded for Sikkim. My specimens are certainly this typical form. Until the type specimen of *P. inornatus mandellii* (Brooks.) has been compared and its correct status confirmed, it is quite impossible to define its distribution, even though it is recorded for Sikkim and the Khasi Hills. Judging from the original description ; the "buff" supercilium seems to be the only reliable character for differentiation. Brooks infers it is likely to be resident. The clearing up of this matter which at present is very obscure, is most desirable.

In working out several difficult groups of Warblers, Chats, &c., I have had the advantage of Mr. Arthur Goodson's experience and knowledge.

145. The Greenish Willow-Warbler. Phylloscopus nitidus viridanus Blyth.

Recorded as distributed throughout the whole length of the Himalayas—Hazara country to Sikkim. I have no personal information of its status in these hills, having totally failed to locate it. Mr. G. E. Shaw has also failed with this species and the two following species.

One ♂ from Kumargram in the Plains of the Jalpaiguri District, Eastern Bengal, collected on the 9-1-22 in open-cultivated country, is referable to this Willow-Warbler. This specimen is "in moult"! Bill from feathers at base, 9; wing, 61.

Unfortunately this race is poorly represented in the B. M. Coll. from the Eastern Himalayas, and Sikkim appears to be east of its main distribution area; there is one specimen collected by Mandelli in May 1876 and one specimen labelled, Darjeeling, 15-1-79, *ex.* Coll. E. W. Oates, probably one of Mandelli's skins, also one specimen *ex.* Hume Coll., Nepal, no data, and one specimen, Nepal Valley, 23-4-77, collected by Scully. Osmaston has recorded this bird breeding in Skkim, Ibis, Vol. XIV, page 816.

146. The Large-billed Willow-Warbler. Phylloscopus magnirostris Blyth.

Recorded in summer "Himalayas:—Kashmir to Sikkim." I have no record of this Warbler in these hills; it must be of rare occurrence, and it is remarkable that "*Acanthopneuste*" should only be represented around Gopaldhara by "*trochiloides.*" As the wing measurement overlaps in this species with "*lugubris*" correctly sexed specimens are essential, despite the different wing formula:—2nd primary between the 7th and 8th or between the 6th and 7th, taken in connection with the stronger bill ought to be sufficient for identification. Wing, ♂ ♀ 62-72. (Hartert.) Mandelli's specimens in the B. M. Collection are few, but there is an undoubted specimen collected in August 1880, which might, however, have been obtained in the higher regions beyond the actual boundaries of Sikkim.

147. The Dull Green Willow-Warbler. Phylloscopus lugubris (Blyth).

Blanford found this Warbler at 12,000′-14,000′ on the Cho La Range and a 10,000′-13,000′ or 14,000′ in the Lachung Valley in the autumn.

As there are *two races or even species occurring in the Eastern Himalayas,* I have gone into some detail with a view to elucidating further evidence as to their identity and status. Singile La Ridge, Nepal-Sikkim Frontier, Kalo Pokhari, 10,160′, 21-4-12. This morning I came across a small party of these birds on arrival at their breeding haunts; they had ascended from the valley below on the Sikkim side of the frontier. It is necessary to mention this fact, as this valley is densely wooded, and if these birds had not been wintering in the bottom of the valley, they must have entered the hills by way of the Tista and Great Rangit Valleys, as the stream which had its rise in the "pokhari" runs into the Lodhoma River, which again is a tributary of the Rammam River; all these waters flow into the Great Rangit River and find their outlet to the plains by the deep gorge of the Tista. I have never come across this Warbler wintering in the valleys or at moderate elevations, and it is somewhat curious such an apparent, roundabout route should be chosen when the Mai Valley offered free access from the south, except perhaps for a deficiency of forest at its upper limits where the land has been partially cleared; this might have been a deterrent to an easy ascent as these birds had certainly worked up with the forest. The most feasible explanation appears to be one more instance of penetration into these hills, but in this instance, that of a migratory species by a route which is well marked. All specimens obtained on this occasion were males, and it is evident this sex arrives ahead of the female; two other ♂ ♂ were obtained on the 27-4-12 at elevations of 9,000′ and 10,000′ respectively, making a total of five secured. I never met with it anywhere else along this ridge. The first and only female secured, being snared on the nest on the 22-5-12. Nest composed of moss and fine bents lined with a few feathers and the hair of some small rodent, probably *Microtus sikkimensis*? common hereabouts. It contained three pure white eggs measuring 16·2×12·6, 16×12·7, 15·5×12·4 mm.

SERIES A.

Six specimens examined :

10,160′, ♂ 21-4-12. Bill from base 13, from feathers 9; wing 64; tail 49; 1st primary, 19; 2nd primary equals the 9th.

♂ Bill 12·5 and 8; wing 65; tail 49; 1st primary 18; 2nd between the 8th and 9th.

♂ Bill 13·5 and 9; wing 66; tail 49; 1st primary 19·5; 2nd equals the 10th.

9,000′, ♂ 27-4-12. Bill 13 and 9; wing 64; tail 49; 1st primary 17; 2nd equals the 10th.

10,000, ♂ 27-4-12. Bill 14 and 9; wing 65; tail 49; 1st primary 18; 2nd equals the 9th. Average male wing measurement, nearly 64·9.

♀ 22-5-12. Bill from base, 12·5, from feathers 8·5; wing 58; tail 46; 1st primary 16; 2nd equals the 10th.

During a month's sojourn in the Eastern Dooars I found a Warbler, the exact counterpart of the former birds, differing remarkably in size. It was more plentiful in the open, cultivated country of the plains, frequenting the bamboo "baris" around the huts of the villagers, than it was in the heavy forest outskirts, in both of which localities I obtained specimens, but failed to make the most of my opportunity, as I merely put them down to "*lugubris*." The differences have only been brought out by comparison. This has necessitated an examination of my Assam material.

SERIES B.

Kumargram, (Plains) Jalpaiguri, Eastern Bengal.

(*a*) ♂ ad. 9-1-22. Bill from base 13, from feathers 9·5; wing 59; tail 45; 1st primary, 17; 2nd equals the 10th.

Bhotan Ghat, (Base of Hills) Eastern Dooars.

(*b*) ♀ ad. 22-1-22. Bill from base 12, from feathers 9; wing 55; tail 41; 1st primary 16; 2nd equals the 10th.

Gauhati, (Plains) Lower Assam.

(*c*) ♂ ad. 12-2-12. Bill from base 12·5, from feathers 8; wing 59; tail 42; 1st primary, 18; 2nd equals the 8th.

In all three examples the greater wing-coverts are faintly tipped with greenish white. The crown in the female is dark and only matched in this character by one male of the A series. Notwithstanding, No. (*c*) has a different wing formula, it appears to be nearest to this race. This specimen and the following five detailed below were recorded in my "Notes on the Birds of Upper Assam" under *P. nitidus plumbeitarsus*, Swinh. and my identification is confirmed by others owing to the presence of two wing-bars, which are either greenish-white or greenish-yellow. *This character appears to be present in birds-of-the-year in this form of P. lugubris,* whereas the tips of the greater wing-coverts in "*plumbeitarsus*" are often of a more defined white; these specimens agree in the general dark coloration with "*lugubris*" even if the wing formula does not in some examples.

SERIES C.

Rungagora, (Plains) Upper Assam.

♂ 16-9-03. Bill from base 13, from feathers 9; wing 58; tail 42; 1st primary, 19; 2nd equals the 10th.

Silonibari, (Base of Hills) Upper Assam.

♀? 30-8-11. Bill from base 13; from feathers 8; wing 58; tail 43; 1st primary 17; 2nd equals the 9th.

Dejoo, (Base of Hills) Upper Assam.

♂ 12-9-10. Bill from base 14·5, from feathers 9·5; wing 61; tail 44; 1st primary 19; 2nd between 7th and 8th. ♂ 11-9-10. Bill from base 13·5, from feathers 8; wing 60; tail 47; 1st primary 18; 2nd equals the 9th. ♂ Bill from base 12·5. from feathers 9; wing 59; tail 42; 1st primary 19·5; 2nd equals the 9th.

The arrival of this Warbler at the foot of the Hills and in the Plains of Upper Assam at the end of August and in the second week of September before the termination of "the rains" may or may not have any significance in reference to a short journey from their breeding grounds, but the small birds in Series B, I venture to surmise will be found to be a form breeding somewhere in the foot-hills with probably only a limited extension into the plains at the cold weather and this may be the solution of the status of the birds in Series C, as these measurements average less than the birds in Series A, which are typical "*lugubris*" but here again these measurements are in excess of Dr. Hartert's. Wing, 59-62, seldom only 57, frequently up to 64·5. My shortest and longest measurement is 55 and 66 respectively, when birds from the combined areas are taken into consideration.

P. nitidus plumbeitarsus is very close to *P. lugubris.* The only reliable characters are the "whitish underside", "very pale on the throat."; the under wing-coverts and axillaries are brighter, the breast is generally stippled with yellow as occurs in "*trochiloides*" and a "finer 1st primary." Whilst the wing formula, 2nd between the 7th and the 8th, is fairly constant, some examples of "*lugubris*" are similar in this respect, as well as having the double wing-bar, but a difference in some of the before mentioned characters will suffice to eliminate "*lugubris*" when a series is compared. In general "*lugubris*" is coloured a more "dusky-olivaceous below and above" and sometimes has a darker head. When "birds of the year" from Upper Assam are concerned, the difficulties are apparent, which is not the case with typical birds from Sikkim. "*plumbeitarsus*" also appears to be a slighter bird which would be more obvious in life. *As there is such an appreciable difference in the size of the sexes in all the species of Phylloscopus it is most essential that the measurements of each sex be stated separately.*

Blanford speaks of his specimens from the far interior at high elevations as having distinct whitish tips to the wing-coverts. These specimens may well have been "birds-of-the-year."

148. **Blyth's Crowned Willow-Warbler Phylloscopus trochiloides** (Sundev.).

Recorded in summer as having been observed in the Himalayas from Kashmir to Sikkim and as "probably wintering in the lower valleys of these parts." A series of four ♂ ♂, three ♀ ♀, obtained at Bhotan Ghat, (Base of the Hills) Raidak River, Eastern Dooars, 20—24-1-22. Gopaldhara, Rungbong Valley, Darjeeling, 3,750′, ♂ ♂ 2-10-19, 5,500′, ♂ 4-11-20. 3,500′, ♂ ♀ 25-3-11. 6,000′- ♂ 25-3-20. Mai "Khola", East Nepal, 8,500′, ♂ 27-4-12, give its zonal distribution fairly accurately during the "cold weather" months and towards the breeding season, as there is little doubt that it *breeds at 6,000′ and upwards.* I have since found the nest containing a juvenile cuckoo, June 1923, at 6,300′, above Seeyok.

Thirteen specimens examined:

♂ Bill from feathers at base 9-10, av. 9·2; wing 56-60, av. 58·6.
♀ " " " " " 9-9·5, av. 9·1. wing 55-58; av. 56·3.

Soft parts: Iris hazel (hazel-brown); bill, upper mandible dusky-yellow, lower mandible yellow or pale yellow; tarsus pale yellowish-plumbeous (yellowish-green); soles paler yellowish-plumbeous (deeper yellowish-green).

All these specimens have the two outer tail feathers slightly margined on the inner web with white.

I have not obtained this Warbler in the Interior of Sikkim. It is evidently *confined to the Outer Ranges* during the breeding season, descending to lower limits during "the cold weather."

149. **The Allied Flycatcher-Warbler. Cryptolopha affinis** (Horsf. & Moore).

Observed plentifully in the *Tista Valley* where it has been obtained up to *an elevation of 5,800′*. (G. E. Shaw). I have failed to locate it in the Rungbong Valley at anything approaching this elevation. All my records refer to *C. poliogenys.* It is somewhat a difficult matter to discriminate between the two species, even when observed at close quarters under good conditions.

150. **The Black-browed Flycatcher-Warbler. Cryptolopha burkii burkii** (Burton).

Apparently this Flycatcher-Warbler has the widest zonal distribution in comparison with the other members of this genus. Common on the *Singile La Ridge at 10,000′ in April and May.* Obtained in Nepal and Sikkim. Numerous records from 3,400′ and upwards in the Rungbong Valley, and obtained as low as 2,000′ in the Tista Valley. (G. E. Shaw). There is every likelihood that it occurs at much lower limits during the cold-season, yet it is strictly not migratory, and it was observed on numerous occasions in the Eastern Dooars in January 1922. Obtained at Bhotan Ghat on the Raidak River, ♀ 24-1-22. Blanford obtained one specimen at Lachung on the 28th September.

Eight specimens examined :

♂ Wing 58-60, av. 59·2. ♀ 53-56, av. 54.

These measurements average slightly larger than a series of five specimens from Assam. ♂ Wing, 57-58, av., 57·7. ♀ 52-53, av., 52·5.

This difference is not surprising and might almost be expected, as more frequently than not, specimens of all these small and other Warblers which have been obtained at the extreme upper limits of their zonal distribution, have a tendency to show a larger wing measurement than other specimens obtained at lower levels, in species which merely move to some slight extent according to season.

151. **Brooks's Grey-headed Flycatcher-Warbler. Cryptolopha xanthoschistos jerdoni** (Brooks).

Hodgson speaks of this form and the typical bird as breeding in Sikkim and Nepal up to 6,000′ or 7,000′. It occurs commonly at *all elevations up to 5,000* and obtained above Mangpu at 5,300, (G. E. Shaw). Generally distributed over the whole area, and apparently the most plentiful of all the Flycatcher-Warblers.

A series of three ♂ ♂, eight ♀ ♀ Sikkim skins measure :

♂ Bill from feathers at base 7·5-8·5, av. 8 ; wing 52-55, av. 53·6.
♀ „ „ „ „ „ 7·5-8·3, av. 7·6 ; wing 50-55 ; av. 51·7.

In comparison a series of six ♂ ♂, two ♀ ♀ Assam skins measure :

♂ Bill from feathers at base, 7·5-8, av. 7·8 ; wing 48·5-54, av. 50·6.
♀ „ „ „ „ „ 7·3-8, av. 7·6 ; wing 47-50, av. 48·5.

One Bhotan Dooars specimen ♀ Bill from feathers at base, 8 ; wing, 49.

Sikkim birds on the whole certainly show more ashy-grey colour on the forehead, crown and nape in comparison with Assam birds which are typical in having these parts coloured blackish-ashy. The measurements however prove the former to be this race.

152. The Grey-cheeked Flycatcher-Warbler. Cryptolopha poliogenys (Blyth).

Occurs in moderate numbers around Gopaldhara at 4,700′ in the Rungbong Valley, and observed sparingly around Kalo Pokhari at *10,160′ on the Singile La Ridge in April and May.*

153. The Chestnut-headed Flycatcher-Warbler. Cryptolopha castaneoceps (Hodgs.).

Generally distributed at *all elevations up to 6,500′* at all events.

Apparently more plentiful from about 4,500′-6,000′. Obtained above Mangpu at 6,300′, (G.E. Shaw). Mai "Khola", East Nepal, 26-4-12; Gopaldhara, 4,720′, 3-11-20; 5,000′, 1-11-18. Namsoo, 2,100′; 13-3-14. A party of about fifteen of these birds amongst which was intermingled a small assortment of *Abrornis albogularis* and possibly an odd pair of *C. cantator.* Bhotan Ghat, Raidak River, Eastern Dooars, 23-1-22; obtained and observed on other occasions. It more often than not keeps to the leafy branches of the lofty trees, and does not frequent the lighter, yet denser vegetation, to the same extent as the other members of the genus.

Semana-Mirik Ridge, 6,000′-6,500′, May, June 1923. I found six nests in all containing both eggs, in one instance a single egg of *Chalcococcyx maculatus* along with the three eggs, one of which was broken, slightly incubated and forsaken on the 22nd of May and in other two cases, single juvenile cuckoos of this species, females, the sole occupants. On the second occasion I visited one of the latter nests at dusk; I was struck by the chestnut head being so prominent as to lead me to believe the parent bird was in possession.

Whilst it would be, perhaps, rash to hazard a guess that the majority of the eggs laid by this Cuckoo in this *Cryptolopha's* nest will prove to produce females and that the eggs laid, for instance in the nest of *Æthopyga saturata* will turn out to be males; yet it would only be in keeping with what we might expect of nature's harmonizing methods.

It builds in the dark recess of an overhanging bank, constructing the usual compact cup-shaped nest of moss, like its congeners with the entrance more often than not facing the bank and opposing its main means of ingress and egress. Although its habits in nidification allow of careful concealment; there is little doubt it suffers depletion of its numbers and eggs through the wiles of snakes, when the brooding parent bird completely disappears with its charge.

The full complement of pure white eggs, steel transparent, is three.

A small party seen on the 13-6-23* were probably composed of the parents and young.

Four specimens examined; wing, 48-50, average, 49, which similarly compares with Assam specimens. The measurements show no appreciable difference between the sexes, which a large series would possibly refute.

Soft parts: Iris brown; bill upper mandible dark horny, lower mandible pale horny; tarsus dusky-horny.

154. Tickell's Flycatcher-Warbler. Cryptolopha cantator (Tick.).

Mandelli obtained numerous specimens of this species which are in the National Collection, but it appears to be locally distributed, and only occurs sparingly at *moderate elevations.* Obtained on one occasion at Gopaldhara 3,500′, in the bottom of the Rungbong Valley, 25-3-11, ♀ Bill from feathers at base 9; wing 51

155. The Yellow-bellied Flycatcher Warbler. Abrornis superciliaris superciliaris Tick.

Confined to *low elevations* only. Great Rangit Valley, 18-2-20.*

Obtained up to an elevation of 3,300′ in the Tista Valley. (G. E. Shaw).

156. The Black-faced Flycatcher-Warbler. Abrornis schisticlps schisticeps (Hodgs.).

Generally distributed but far from common and with a *restricted zonal distribution.* Obtained around Gopaldhara up to an elevation of *5,800′*, apparently not to be found below *5,000′*, also obtained above Singhik at 5,200′, in the interior of Sikkim, 12-3-20, one ♂ secured; several noted in a mixed party of *Cryptolopha, Periorocotus,* and in forest, on lofty trees. Gopaldhara, 5,000′, 26-2-19, ♂ testes enlarged; shot out of a large party of mixed species of small birds, in heavy forest. 5,500′, ♂ 14-11-20, noted as a difficult optical task to distinguish between this *Abrornis* and *Chelidorhynx hypoxanthum*; both of which species were mixed up with *Minla, Ixulus flavicollis* and other small Warblers; the open tail and short flights of *Chelldorhynx* were of course distinctive and it was only when this trait in this Flycatcher was observable the Flycatcher-Warbler could be identified with certainty.

Three specimens examined:

♂ Bill from feathers at base 6·5; wing 48.

Soft parts: Iris red-brown of a defined tint; bill dark ochreous-horny (pale brownish-horny),—a somewhat unusual colour for the bill in comparison with its near allies; tarsus olivaceous-horny (dusky-olivaceous); claws similar.

157. The White-throated Flycatcher-Warbler. Abrornis albogularis albogularis Hodgs.

Only found at *low elevations* probably not exceeding 2,500 or thereabouts. Observed in the Great Rangit and Tista Valleys, also in the Balasan Valley, Namsoo to Panighata.

158. The Broad-billed Flycatcher Warbler. Tickellia hodgsoni (Moore).

Observed and obtained on numerous occasions in the Rungbong Valley from *3,800′, July, to 6,000′, March,* and there is no doubt *these limits are exceeded in an upward direction.* Gopaldhara, 3,800′, 19-7-21;* 5,900′, ♀17-2-18; 5,800′, ♂ 6-2-21; 6,000′, ♂ ♀25-3-20,* in scrub-growth, every indication of their being about to nest, 4,200′, ♂ ♀ 10-10-17.* 3,700′, 14-4-23,* a pair in evidence. 5,800′, 24-5-23,* a pair in company with a mixed assortment of small birds.

This Flycatcher-Warbler has very much the same habits as Horornis. It keeps to the dense undergrowth, and though its high pitched note and bright coloration is apt to cause it to be more easily located; it is only on rare occasions, it may be observed to advantage. Due to this trait in its habits I have been entirely misled; as I had been under the impression all the birds that had come under my observation were *Phyllergates coronatus.* On comparing my Assam skins of the latter, it was then only apparent, as there is no likelihood of this Tailor-bird, which could only possibly occur in the foot-hills, ever being located at similar elevations. Had I only examined the bills of the few obtained, apart from my disinclination to shoot what I rightly regarded as a none too plentiful and interesting bird, my mistake ought to have been apparent; instead of which my interest has always been centred on the tops of the trees, wondering if ever I should be fortunate enough to locate one of the few rare birds whose whereabouts had so far baffled me. Even the field-ornithologist, left to his own resources, has his difficulties.

Two specimens examined :

♂ Bill from feathers at base 8·5 ; wing 47·5. ♀ Bill 10 ; wing 46·5.

159. The Aberrant Warbler. Neornis flavolivacea flavolivacea Blyth.

Dr. Hartert considers this Warbler congeneric with the four species to follow which are all included in the genus *Horeites.*

In common with other near allies, probably only breeding at high altitudes and descending to the valleys in the winter. The distribution as given by Oates is conflicting. Himalayas, 6,000′-10,000′, " breeds 3,500′-6,000 " and is evidently a mistake. Obtained near Kalo Pokhari in East Nepal at *10,000′,* ♀ 7-5-12. Bill from feathers at base, 10 ; wing, 54.5. Gopaldhara, Rungbong Valley, Darjeeling, *3,500′,* ♂ 13-2-19. Bill from feathers at base 10 ; wing 57. Well represented in the B. M. Collection, May, June, August, October-December (Mandelli).

160. Hume's Bush-Warbler. Horornis acanthizoides brunnescens (Hume).

Obtained near Kalo Pokhari, in East Nepal at *10,000′,* ♀ 29-4-12. Bill from feathers at base, 9 ; wing 50. Above Karponang, in the interior of Sikkim also at *10,000′,* ♂ 24-3-17. Bill feathers at base 8 ; wing 52. On the latter occasion procured in dense "prong" bamboo thickets, a habitat similarly frequented by *Conostoma œmodius.* Well represented by Mandelli's Sikkim specimens in the B. M. Collection, January, February, April, November, but most without any data as to exact localities.

161. The Strong-footed Bush-Warbler. Horornis fortipes fortipes. Hodgs.

Occurs commonly around Gopaldhara, descending to the bottom of the Rungbong Valley in winter. Obtained at an elevation of 3,600′ in the Tista Valley, (G.E.Shaw), and also at Chungthang at 5,500′, on the 26-2-20 ♂, in dense bamboo growth. Gopaldhara, 3,700′, 18-4-23, in evidence in a favoured locality, with its high-pitched long drawn out note and a subsequent short trill, otherwise difficult to locate as the few odd birds rarely showed themselves for anything but a brief interval. There is some individual disparity in size as the following measurements show :—

Four specimens examined :

♂ Bill from feathers at base 8·5-11, av., 9·8 ; wing 50-57, av. 54.
♀ ,, ,, ,, ,, ,, 9 ; wing, 49.

Seven Assam skins for comparison measure :—

♂ Bill from feathers at base 9·5-10, av. 9·8 ; wing 50-56, av. 52.
♀ ,, ,, ,, ,, ,, 10, av. 10 ; wing 48-53, av. 50.

162. Blanford's Bush-Warbler. Horornis pallidipes (Blanf.).

Recorded as "breeding in Sikkim, Ging and Lebong near Darjeeling, May to June." Represented in the B. M. (Hume Collection) by 8 Sikkim skins, March-May, August, 1875-79, (Mandelli). 2 skins May, 1875, (Tweedale Collection.) and 4 skins from the Bhotan Dooars, January and April, 1876-77. (Mandelli).

163. The Large Bush Warbler. Horornis major (Moore.).

Recorded for Sikkim. " breeding high altitudes (Lachung.) in July." Represented in the B. M. Collection by 13 specimens, April-June, August, October, November 1872-76 (Mandelli). 1 specimen L. A. Waddell and a ♀ 23-10-70. Senchal 8,000′, (Blanford).

164. The Golden headed Warbler. Phyllergates coronatus (Jerd. & Blyth).

Recorded for Sikkim. Probably confined to the base of the hills and the valleys of the interior at low elevations. There is a specimen dated February 1873, Mangpu and many others from Sikkim.

165. The Rufous-capped Bush-Warbler. Horeites brunnifrons (Hodgs.).

A cold-season visitor to the Rungbong Valley descending to 3,600′ and possibly much lower, ascending to *10,000′ and over on the Singile La Ridge,* at and about which elevation it breeds. Obtained around Mangpu at elevations of 3,600′-3,900′ during the cold-weather, (G. E. Shaw). Gopaldhara, 4.000′, 28-1-19.* 6,000′, 26-12-20. Mai Valley, East Nepal, 8,000′ and upwards, ♀ 18-3-12. ♀ 28-3-12. ♂ 4-12, evidently on the upward migration, extending up the valley with the advent of warm weather. Kalo Pokhari, 10,160′, ♂ ♂ 12-4-12; ♂ 16-4-12; ♂ 25-4-12. ♂ 12-5-12; ♂ 22-5-12; males much in evidence. During the first weeks in April it utters a loud, sweet, if short song. Nests composed of grass and bents with an interior lining of feathers; clutch, usually four, on one occasion five eggs. Blanford records it from the Lachung Valley at 10.000′-12,000′ (September).

Nine specimens examined:

♂ Wing 45-49, av. 46·9; ♀ 44-47, av. 45·4.

The measurement of the bill varies little in either sex being 8-8·5.

Soft parts: Iris hazel; bill dark horny, basal half of lower mandible pale yellowish-horny, darkening towards the tip; tarsus pale brownish-horny.

166. The Brown Hill-Warbler. Suya crinigera crinigera Hodgs.

Recorded as occurring upto 6,000′ in the Himalayas. I have failed to obtain it on the Western side of the District of Darjeeling. It has some *status to the East,* where it has been obtained in the *Tista Valley* at elevations of from 2,800′-3,900′ around Mangpu by Mr. G. E. Shaw. This species is well represented in the B. M. Collection from the Sikkim Himalaya and a number have reference to the lower hills around the Tista River, where Gammie stated it bred up to 3,500.′

167. The Black-throated Hill-Warbler. Suya atrogularis Moore.

" Chiboorchay " Paharia

Gammie is mentioned as having found this species breeding around Mangpu, but so far Mr. G. E. Shaw has not obtained it from this same locality. There may be some error in reference to its nidification in this area. I could find none of Gammie's specimens in the B. M. Collection. It occurs commonly both in *East Nepal,* in the Mai Valley up to 7,000′ and numerous as a resident, breeding species in the Rungbong Valley of the Sikkim Himalaya at elevations of from 3,400′-6,500′, at all events. I found the nest on the Semana-Mirik Ridge, containing the full complement of four eggs, at an elevation of about 6,700′, 6-5-23. Mr. C. M. Inglis has obtained it in summer at Jore Pokhari 7,400′ and at Rinchenpong 6,000′. Oates doubts Hodgson's specimens as having come from Nepal. I have no knowledge of its western limits beyond where it was obtained.

168. The Ashy Wren-Warbler. Prinia socialis socialis Sykes.

Recorded for the Lower Ranges of the Himalayas upto 4,000′. This species is well represented in the B. M. Collection by numerous specimens from the Bhotan Dooars collected by Mandelli, and others in the Seebohm Collection evidently Mandelli's skins also, with no definite data excepting the locality Sikkim. Its exact status in the valleys of the interior is obscure.

(*To be continued.*)

REVIEWS.

BUTTERFLY LORE. BY H. ELTRINGHAM, D.SC., M.A., F.Z.S., F.E.S., CLARENDON PRESS, OXFORD. PRICE s. 4-6.

(180 pp., 1 coloured plate, 52 text figures, 5×7½).

The title of this book is somewhat misleading. It deals equally with Butterflies and Moths ; it is not concerned with descriptions or classification ; it does not teach the reader how to catch butterflies or how to preserve them. The object of the book is to set forth in simple language certain interesting details of insect life. The life history is described in detail, chapters being devoted to the egg, caterpillar, chrysalis and perfect insect. Then follow descriptions of the senses, scents, methods of concealment, mimicry and polymorphism. The geological record in respect of butterflies is lightly touched upon and there is a chapter dealing with the relations between butterflies and ants.

The subject is treated in a light vein and there are no technical terms or intricate scientific descriptions. The whole book is absorbingly interesting from start to finish and one is amazed at the revelations obtained by the use of a high power microscope. The most interesting chapters are perhaps those on mimicry and on the senses of butterflies and moths. The various artifices that insects employ in order to keep their place in the acute struggle for existence are simply marvellous . Most people are aware that many butterflies mimic others that are distasteful to enemies and that many again are coloured so as to resemble their surroundings, but it will be news to many of us that there are caterpillars provided with poisonous hypodermic syringes, others with fiendishly shaped poisoned spikes, and so on. It is shown that butterflies and moths have but poor eyesight, though the structure of the eye is extraordinary and entirely different to that of a mammal's. The sense of hearing is doubtful though, as in a few exceptional cases the insects can make a noise, it is reasonable to assume that their mates can hear them ; in some moths there appears to be a well developed ear on either side of the body. The senses of touch and taste are undoubtedly more or less developed. But it is the sense of smell that in certain instances is so extraordinary, while a very large number of the insects are provided with a wonderful scent producing apparatus. In addition it is suspected that insects have a sixth sense that we do not possess and can only imagine with difficulty ; that is sense of what may be called gravity, which permits a butterfly to sweep through dense forest at great speed without touching a twig in spite of its poor eyesight. The microscopic examination of a butterfly's feelers or antennæ reveal the presence of four distinct types of organs, the uses of which are little known ; additional organs are contained in the palpi, which are appendages in front of the face on either side between the eyes.

The ordinary reader will find the book full of interest while for the expert naturalist there is a great deal of matter that he will find new to him, that has been gained from recent experiments and discoveries.

W. H. EVANS.

A BIBLIOGRAPHY OF FISHES. By BASHFORD DEAN and others. 3 volumes. (Vol. I, 1916 ; Vol. II, 1917 ; Vol. III, 1923 : New York). Published by the American Museum of Natural History in the Science Education Series.

Ichthyologists and naturalists in general owe a deep debt of gratitude to the American Museum of Natural History, and to Professor Bashford Dean and his colleagues Messrs. C. R. Eastman, E. W. Gudger and A.W. Henn, for their *Bibliography of Fishes*, the third and last volume of which has just appeared. Each volume consists of over 700 pages of close print. The first two contain a catalogue of all papers on recent and fossil fishes published from the year 1758 the items arranged alphabetically under the author's names ; while the third contains a subject index and much miscellaneous information such as "Titles of Pre-Linnean Publications," "List of Periodicals relating to Fish and Fisheries", etc. The subject index is arranged in three main sections, (*a*) Morphological and general section, (*b*) Systematic section and (*c*) "Finding index."

The value of bibliographical work on so comprehensive a scale can hardly be exaggerated at the present day, when biological investigations of all kinds are hampered by the publication of an enormous mass of uncorrelated details. So far as we have been able to test the volumes published by the American Museum of Natural History the work has been done with the greatest possible care and extremely few references have escaped the notice of its authors. We congratulate them on the completion of an unusually important, laborious and careful investigation, which is of infinitely greater value to the cause of science than much so called original research.

N. ANNANDALE.
S. L. HORA.

WILD ANIMALS IN CENTRAL INDIA. BY A. A. DUNBARBRANDER, F.Z.S., F.R.G.S., Conservator of Forests. London, 1923 ; Edward Arnold ; pp. xxii+296, 19 plates ; price 18 Shillings, nett).

It has often been remarked that the writing of books on "Shikar" in India has been overdone, and this, in respect to some previous publications, has been said with some justification.

The book under review *Wild animals in Central India* by Mr. A. A. Dunbar Brander comes under a very different category, and will be welcomed by sportsmen and field naturalists as an interesting and accurate work, useful to those with experience and invaluable to novices. It is the result of diaries and notes kept during twenty-one years passed in the Forest Service, and shows that the author has indeed learnt "to grow wise in more than woodlore alone."

Mr. Dunbar Brander tells us that during about six of his twenty-one years he practically ceased to shoot, and says, "It is to this period that I am chiefly indebted ; one can see so much more of an animal, and under such different circumstances, if one is intent on not killing it." How very true this is all sportsmen know.

The object of the book is described by the author to be to supply information to the field naturalist and sportsman who takes an intelligent interest in the animal he is hunting. It does not claim to be a guide to the hunting and killing of the various animals dealt with. To the reader of experience, however, it will be abundantly evident that the volume is a guide both to sportsmen and field naturalists ; and the author can be assured that all who read his book will derive both pleasure and profit from its perusal.

The arrangement of the book is good, and the writer expresses his meaning in a clear and attractive manner. One wishes that the index had been more full, and that there could have been more than the nineteen illustrations from photographs ; some of which might have been better, that of the two wild bears in particular.

Twenty-four pages, full of incident and interest, are given to the habits of the sloth bear, to which animal the author accords pride of place, in matter of intelligence, over all the beasts in the jungle, the Primates excepted ; and in the reasons given for this view he takes the reader with him. In addition to telling us all there is to know concerning the sloth bear, Mr. Dunbar Brander breaks new ground as to his habits and character; and also sets out to lay at rest certain errors which, he considers, have been handed down from the earliest writers.

As to the known fact that the sloth bear has a very strong sense of smell, as far as his food is concerned, and the anomaly that this animal is certainly not difficult to approach when stalked or hunted, the author propounds the theory that this bear is "short-scented" and fully explains what is meant by this term. The theory is probably correct: and sportsmen will be interested in confirming it by taking particular notice of the direction of the wind, in their future pursuits of "bruin" and so ascertaining whether, and at what distance, an adverse wind affects the hunter's approach.

In regard to the manner of attack on human beings, our author is still on controversial ground. He says he has never known bears, in seizing their enemy, to stand upon their hind legs or attempt to hug: and that their usual method is to knock the man over and burrow off his face and scalp with their fore paws, adding that on occasions they will bite, but that they chiefly rely on their fore-paws as their chief weapons of offence. A sloth bear certainly does not hug his enemy. That is a popular legend not founded on fact. But it cannot be said that it is unusual for an attacking bear to stand up on his hind legs; or that the fore-paws are the chief weapons of offence. Your reviewer's experience is to the contrary; and in no case have wounds inflicted by sloth bears on human beings been found to be from claws. The question could be satisfactorily settled by medical reports from an area where injury by bears is of frequent occurrence.

Other habits also are discussed and the character of the beast illustrated by amusing anecdotes. All who know "bruin" will agree that his manners are uncouth, his character uncertain, and that he is a very real danger in the forests to unarmed people. Regarding the wild dog, a photograph of which would have been a welcome addition to the illustrations, the author has much to say, a good deal being new and interesting matter. The species is unpleasantly common in the jungles of Central India and we are told how to destroy these pests by means of an emulsion of strychnine, the strength of which is wisely not given, but is known to those properly interested in the matter. Their manner of hunting and killing is described; the story that they are in the habit of emasculating the animals they attack being discredited from personal observation. This is only one of a number of such observances by which the value of this work is enhanced. The chapter is full of interest.

In respect of tigers and their ways our author writes in the light of a wide experience and intimate knowledge, having shot, and seen shot, upwards of two hundred tigers; besides having to his credit the years of observation, without shooting, which have already been mentioned. The subject is dealt with in two chapters entitled "Distribution—Size and Habits" and "Tiger Hunting."

The question of the twelve-foot tiger is sufficiently discussed, and some authoritative weights and measurements of exceptionally large animals are given. The reader will find much regarding the habits of the tiger that is of great interests. Mr. Dunbar Brander is able, from personal observation, to give a detailed description of methods of killing, as against the conjectured accounts of so many other writers. It is satisfactory to read that our author wholly discounts the story for it is nothing else—that tigers and panthers suck the blood of the neck. Because, from time immemorial, a bear has been said to hug his enemy, therefore he must do so: because a tiger is a blood thirsty animal, therefore he sucks the blood of his victim. These are popular beliefs and difficult to dispel. And in regard to the latter which is so deep-rooted among jungle people and Indian shikaries as to be practically ineradicable, the sportsman will be wise to allow the harmless legend to continue and so avoid being held to be an ignorant person. All readers with experience will agree that the tiger hunts wholly by means of sight and hearing, and has very little sense of smell. This, and the marvellous sense of locality—shared by tigers and panthers alike—is illustrated from observations of a tame tiger which the author once possessed.

To extract more than this from the book would be unfair to the author : suffice it to say that even the most experienced will find something that is new to them, and any future writers will find it difficult to add to the wealth of information furnished by Mr. Dunbar Brander.

Of "tiger-hunting," as carried out and suitable to the jungles of Central India, the author gives us much that is sound and sensible. Stalking on foot and shooting the animal on his kill : hunting with dogs and shooting the bayed tiger on foot : accompanying village cattle to graze and shooting the marauder while its vigilance is lost in the ecstasy of killing : sitting up over the kill : and, lastly, beating. All these methods are discussed and dealt with, the last named being that most strongly advocated, a conclusion with which all will agree. Mr. Dunbar Brander bars the use of the electric lamp for night shooting, considering that it does not give the tiger a fair chance, and pertinently asks "if we once admit the electric lamp where are we to stop?" The practice of shooting tigers with aid of artificial light has been officially prohibited in the Forests of the United Provinces : and most sportsmen will agree with the author that, except to get rid of a pest, or, it may be added, in such dense jungles as absolutely prohibit any other method, the use of electric torches oversteps the mark of what should be held to be sporting.

Some twenty-five years ago the late Mr. Reginald Gilbert contributed to the Journal of the Bombay Natural History Society an article designed to reduce the number of casualties to sportsmen by telling them what to do and what precautions to take when following up a wounded tiger : and our author tells us that in 1916 the number of casualties which took place induced him to draw up a few simple rules with a similar object. These are reproduced in the present volume and it would be an excellent thing if this summary of "rules and precautions to be taken so as to reduce risks in tiger shooting" were printed and issued with all shooting passes.

Very excellent advice as to what description of weapon to use is given, as also an instance of the uselessness of firing at a tiger with a high velocity small bore. Some instances of failure of even the heaviest weapons are recited: To all the author has to say, one thing, obvious though it is, may be added, and that is : "it is the first shot that counts the most and that shot should be taken with all possible care so that the bullet will strike or reach a vital spot. An initial shot, fired with insufficient deliberation, may have disastrous results."

Of leopards or panthers there is a somewhat less full account than of the tiger : but practically all is said that the subject requires. The question as to whether the tiger or the panther is the more dangerous, from the sportsman's point of view, is discussed ; and some weights and measurements are given. Habits and character are illustrated by suitable incidents and the chapter generally gives a sufficiently full account of the panther and his ways. The author rightly rejects the contentions of some former writers who have tried to divide *Felis pardus* into two, and even three, species, based on size or number of caudal vertebrae, etc., and tells us that throughout the length and breadth of the land there is but one *Felis pardus* : a beast of great variability in size and colouring, these being more or less occasioned by food supply, habitat, etc., etc. As to shooting of panthers by aid of artificial light we are told "as leopards can be considered vermin pure and simple, the ethics of how they are killed does not arise." May sportsmen trap or poison them ? Wild dogs may be poisoned, so why not panthers ! We think that *Felis pardus*, indomitable beast that he is when wounded, and no mean antagonist at any time, deserves a higher status than that assigned to him.

Gaur and buffalo are dealt with in one chapter, the former animal being better known to our author than the latter. That bison are dangerous animals to hunt is shown to be a common error, with which conclusion those who have the necessary experience will be in full agreement. This noble denizen of our Indian jungles is fully and accurately described, some measurements are given, the weight of one animal is recorded, and instances in illustration of their poor sight but excellent sense of smell are related. There is no finer sport to be had than bison shooting with the aid of trackers. The author touches upon this and other methods of hunting this animal. Your reviewer would put the case against driving of bison stronger than does the author, and for a different reason, and bar it altogether as "overstepping the mark." Measurements to indicate the huge dimensions attained by the Indian wild buffalo are given and some recorded weights and measurements are referred to. Buffalo in Central India, and adjacent parts of the country, are now so diminished in numbers, that but few of the future generation of sportsmen will be able to include among their trophies the imposing horns of this animal from anywhere outside Assam and Bengal. The tracking of buffalo is a sport equal to that obtained in pursuit of the bison, with a more exciting element in it, as this animal is undoubtedly more dangerous to deal with, when wounded, than is the bison ; though it is to be doubted whether he is so invariably dangerous as is popularly supposed : at least that is the opinion of the present writer based on experience including the following on foot of two wounded bulls.

The largest of the deer tribe in India—the Sambur—is dealt with in fullest detail, and we are told all there is to know about the species ; indeed it may be said that the most experienced sportsman could add nothing to the information given. Sambur in Central India run larger, both in horn and body measurement, than those from the Terai, Southern India, and other parts of the country. The largest and heaviest stag measured by the author was five inches less in height than the 64 inches to which Lydekker states the species attains. A sambur measuring 64 inches at the shoulder could certainly not be found outside Central India. The oft repeated story that old sambur stags do not shed their horns annually is rejected with sensible remarks to the effect that when a sambur in full horn can be shown to have been shot in August or September then the story may be worthy of further investigation. In this chapter, as elsewhere in the book, one meets with remarks and advice which should be borne in mind by all true sportsmen. The swamp deer, or "barasingha," of the Central Provinces, is less well known to sportsmen in general than either the sambur or chital, the extensive information given in the present volume being therefore all the more welcome. Illustrations from photographs of the horns of both this deer and of sambur show the more usual of the various types which are met with. The author says that swamp deer are far more immune, and suffer less casualties, from rinderpest and foot and mouth disease, than do sambur and bison. It would be interesting to learn why this should be the case. Marked differences between the swamp deer of the Central Provinces and those of the Terai are brought to notice and commented upon, so giving rise to conjecture as to which of these areas was the original habitat of the species. Our retiring little friend the barking deer : muntjac : rib-faced deer : kakur, etc., as this widely known animal is variously designated,is the smallest of the deer tribe to be found in the Central Provinces. The several peculiar characteristics of this interesting animal are discussed. Concerning the much debated point as to how the "castanet" noise is made by these deer, the author concludes that it is merely a modified form of the usual cry of alarm, the sound being jerked out while the animal is in motion at the time. That it is a voice cry is probably correct, and confirms the conjecture of the present writer. Why should the kakur, when slightly alarmed, make noises with its feet, or its teeth, if indeed it can make such noises !—when the natural mode of expression would be the voice. Your reviewer has heard this noise made by a female kakur which has not got canine teeth. Instances of injury caused by the peculiar canine teeth of the male of this deer are recounted. Your reviewer once saw a case of a cow buffalo receiving a cut, nearly eleven inches long, by which it was in danger of being disembowelled, from a male kakur which got among the herd and became frightened. The wound was sewn up and the buffalo recovered. It was not possible to say whether the injury was caused by the canine tooth, or the sharp edge of a chipped horn—most likely the latter. The cut was a clean one.

The antelopes are dealt with under one chapter, the nilgae or blue bull, the blackbuck, the chinkara, and the four-horned antelope being all described, habits discussed, and weights and measurements given. As might be expected the author is not able to tell us much that is new in regard to these well known animals. The elaborate arrangement of hairs inside the ears of chinkara, designed by Nature to protect them from flies and insects, is remarked upon. Black buck are similarly protected but in a lesser degree and camels have a very efficient " hair entanglement " of the same description. On the Indian wild pig we have a chapter entirely readable and informing, which, while not aspiring to deal with the pig except from a sportsman-naturalist's point of view, yet gives the novice an insight into the art of pig sticking. The " maxims for the novice" are amusing, and probably wholly effective in guiding those for whom they are intended. The field naturalist will find ample material upon which to reflect: and several things which he may not have himself observed. The concluding chapter deals with other jungle animals, the bats and rats being excluded, those only which are likely to interest the average sportsman are selected. And as regards these the author endeavours to confine his remarks to matters of special interest. Hyaena, wolf, jackal, fox, caracal or lynx, hunting leopard, wild cats, civets, mungooses, the Indian ratel, otters, squirrels, the mouse deer, crocodiles, python ; all these are discoursed upon, and the reader will learn much that he did not know before. We are not told that the hyaena will attack and kill human beings ; that has been known near Nowgong in Central India. Of the wolf the author has had little personal knowledge, so also in respect to the caracal, commonly misnamed lynx, and the hunting leopard, all of which are rare animals in Central India. About the ratel there is much said that is not generally known. The animal is very seldom met with. Natives hold them in great dread. We are told how to trap crocodiles, and how to shoot them, with much else besides. The last paragraph of this informing volume relates a remarkable instance of display of what appears incredible forethought and reason on part of a python. This however is the experience of a friend of the authors and not from his personal observations.

And so the pleasurable task of reviewing this excellent book comes to an end, with the closing advice, from your reviewer, to both the experienced and the inexperienced to take it with them into the Forests of Central India, and elsewhere, and add, if they can, observations of their own on the various animals so ably dealt with by Mr. Dunbar Brander.

R. B.

HIMALAYAN AND KASHMIRI BIRDS. BY DOUGLAS DEWAR, I.C.S.
(London 1923 ; John Lane : The Bodley Head Ltd.; pp. 200 ;
price 7 Shillings and 6 pence nett).

We have received for review a copy of Mr. Dewar's latest book " Himalayan and Kashmiri Birds " which is intended to be a companion and complementary volume to his earlier "Indian Birds," so that the two books between them cover almost the whole of the Indian Empire, exclusive of Burma and Baluchistan.

As in the first work, the present volume is intended solely for the amateur ignorant even of the names of the commonest birds that he meets with in his rambles. Its scope is limited to the birds of Kashmere and the Himalayan Hill Stations ordinarily met with in the zone between 5,000—7,000 feet above sea-level and that in summer ; a total of 179 species have been selected as fulfilling these conditions, and the number has been designedly kept as low as possible in the effort to avoid distracting the beginner by an " embaras de richesse."

The book is divided into two parts. Of these the second part is the more important and may be considered the main body of the work. It is a descriptive list of the 179 species under consideration, comprising their names, descriptions, habits and distribution, with their reference numbers in the "Fauna British India, Birds" and Jerdon's "Birds of India."

The first part of the book is intended to be a key to the second part, guiding the novice to identification of a bird by means of its salient characteristics in life. The key is divided into three sections. In the first of these the birds are classified by their structural peculiarities, such as bill, crest, tail and sexual dimorphism in so far as these points catch the eye of an observer in the field ; in the second the classification is by salient points of colour ; in the third stress is laid on habits and habitat.

The success of such a key of course depends on the closeness with which the author succeeds in estimating the points that strike the average observer. We have tested the key from that point of view and have found it work very satisfactorily.

The descriptive list is somewhat harder to estimate. Opinions may differ as to what species should have been included or omitted but on the whole the selection has been most judicious, except perhaps under the heading of "Warblers" a group with which Mr. Dewar is but slightly acquainted, as appears from the evidence of his previous books. The descriptions of plumage and habits are as clear and succinct as possible, with the limits imposed, but there is a good deal that is misleading in respect to distribution. It is a pity that Mr. Dewar did not have his proofs read by others acquainted with the Hill Stations which he has not visited personally.

We are glad to see that the book is free from the attacks on the scientific student that disfigure so many of Mr. Dewar's writings. But if Mr. Dewar desires to continue as an instructor of the public mind he must bring his work more up to date.

Here as elsewhere the reference numbers of the various species in Jerdon and Blanford and Oates are appended. Jerdon is worthy of all honour both as a pioneer and as a very fine field naturalist and descriptive writer ; but to refer the novice to a work hard to obtain and whose classification and nomenclature are obsolete is of little value.

The references to the Fauna are important and should be cited. But the first edition of the Fauna to which all references are given is both out of date and out of print. One volume of the new edition has appeared, another is in the press, and the changes as a whole have been foreshadowed in the "Hand list of Indian Birds, which the author of the new edition has contributed to the Bombay Natural History Society's Journal. The binomial system has given place to the trinomial, and many old names have been disturbed in the revolution of nomenclature. Surely it would have been kinder to introduce the novice to the names which his generation will use and not to the names current when Mr. Dewar was himself a beginner. We may deprecate the changes but they are necessary whether we like them or not, and all change is not necessarily for the worse : to cite a case in point:—

Years ago the writer on his first visit to the Hills secured a lovely blue thrush which appeared to be common enough ; yet search as he would he could not identify it in Volume II of the Fauna amongst the *Turdidæ* to which it most obviously belonged. Some forgotten chance revealed the bird as *Myiophonens temmincki* No. 187 in Volume I. The beginner's instinctive recognition of the species as a thrush has since been confirmed by the scientific world. Yet true to his text Mr. Dewar continues to show the bird as a Babbler, doubtless to the confusion of many another beginner. Here is a change that he might admit, and there are others that cannot reasonably be resisted. Growth and change are a feature of every healthy organism and to stand still is to admit defeat.

H. W.

EDITORIAL.

The maxims of Wilkins Micawber do not find a place in the statement of accounts published on page 1067 of this number. Yet, in the manner of that well-meaning though much-embarrassed financier, our Honorary Treasurer might well have indicated the disastrous consequences which must inevitably result from pursuing a policy which produced such a decidedly unfavourable balance sheet.

> "Our receipts (other than what should be treated as capital and amounts received on account of Game Books, etc.), as compared with expenditure, appear to show a deficit on the year of very nearly Rs. 10,000."

The causes leading to this gloomy result are indicated—

> "a decrease in subscription apparently due to the fact that twice as many members resigned from various causes as joined the Society."

So much as regards decrease in our revenue, similarly on the expenditure side we appear to entertain our very especial "Ruhr" problem :—the cost of the Journal

> "which shows a further increase of nearly Rs. 15,000 over last year, and now costs Rs. 11,400 more to print than it did three years ago, an increase of nearly 100 per cent. over 1920 printing charges."

"Expenditure under all other heads shows a decrease."

The source of our trouble stands revealed, namely—our anxiety to provide the members of this Society with a Journal which would make its arrival an event to be looked forward to ; this has been our undoing, but appreciation of our efforts has not been wanting, witness the letter from a member, now retired from this country, who writes that he has changed his mind about discontinuing his membership, because he finds the Journal so interesting. An old Life Member, one of that fortunate class who came in when the Life subscription stood at Rs. 200 makes open confession :—

> "After considerable thought I have come to the conclusion that I am obtaining too great value for the Rs. 200 Life subscription, when the cost of printing and prices in general are taken into consideration."

Obviously in casting our bread plentifully upon the water we looked for some such response as this : we looked to a wider circulation, to an increased membership roll. But the harvest has been disappointing. Why have we failed ? Is it possible that it is due to the lack of a keen interest and active co-operation on the part of members of this Society ? May we, in return for our efforts to produce a good Journal, appeal to members for a fuller recognition of those responsibilities which make for more active membership ? It has been suggested that the work of the Society is insufficiently advertised. "If you want a thing well known—speak about it to your friends", thus Lord Leverhulme explains his phenomenal success as a salesman. A member writing from London advises us that he has bought a complete set of the Journal down to the end of the last volume, all being bound except the last volume, for £32. He adds "There have been quite a number of sets, but mostly incomplete, offered in London during the past twelve months and up to £40 has been asked. *I think if the Journal were better known over here* that you would obtain a number of subscribers. Certainly there is not in my opinion any Journal like it, and there are always interesting articles on Sport and Natural History in all its branches."

Will members personally assist during the present year in making the Society better known among their friends and help to further their own interests by adding at least one new name to the membership roll ? Another two hundred members would place our finances on a sounder basis and a guarantee would be afforded for the continuance of the policy which endeavours to keep our publication at its present standard. We must all agree with the Finance Member of the Viceroy's Council that we must cover our deficit and if we cannot cover it by means of increased revenue we must use the Geddes and Inchcape Axe and cut down the Journal, including therein the Editorial.

The presen year will probably write *Finis* to the work of the Society's Mammal Survey of India, as it is unlikely that fresh funds will be forthcoming for the continuance of this enterprise. Of the value of the work that the Survey has accomplished it is unnecessary to comment—before long we hope to see the results of this unique endeavour epitomised in a new volume on the Mammals of India in the Fauna of British India Series. Two of the Society's collectors are still at work. One of them is now negotiating the Pindari Glacier under the guidance of Col. R. W. Burton, to whom our thanks are due for his continued assistance in obtaining material for the Survey and the Prince of Wales' Museum. To Major C. H. Stockley we are in like manner indebted not only for his interesting narrative of a 'Journey to Siam and Back,' but also for many valued contributions to the Society's Museum. The subject of the Survey brings us to mention that very interesting expedition which left England last February for Polynesia, *via* Madeira and the Panama Canal, on the Steam Yacht " St. George " chartered by the Expeditionary Research Association with the object of carrying out scientific research in various parts of the globe. The scientific director of the expedition is a member of this Society, Mr. James Hornell, late Director of Fisheries, Madras. Mr. Hornell will take charge of the Ethnological work, Dr. C. Crossley of Marine Zoology, and among others the party includes an Ornithologist, an Entomologist, a Botanist and a Geologist. We wish the Expeditionary Research Association every success in the enterprise and are gratified to know that a member of this Society is serving it in so honoured a capacity.

Before leaving India, Mr. Hornell sang his *nunc dimittis* in his administration report of the Madras Fisheries Department for the year 1922-23. In the report we find the results of his years of endeavour to place this department on a satisfactory basis. He writes, " In several respects the past year has proved a record ; all the important Revenue sections have prospered exceedingly and I can leave the department with the knowledge that it has successfully turned the corner of adversity caused by the aftermath of the Great War. My successor will find the department fully reorganized and the lines of further progress definitely marked out so soon as the finances of the country justify renewed expansion." It must have afforded Mr. Hornell particular gratification to be able to round off his fifteen years' work in Madras with so highly satisfactory an account of the result of his stewardship. One of the last acts of Mr. Hornell was to secure for publication in the pages of this Journal a series of papers on Indian Marine fish by Dr. H. W. Fowler of the Academy of Sciences, Philadelphia. The urgent need for a revision of our knowledge on this subject has been apparent for some considerable time—the works of Francis Day are now obsolete, and the nomenclature is out of date and in many instances erroneous. Dr. Hora of the Indian Museum has for sometime been engaged in the study of fresh water fish, but the marine forms have been hitherto practically neglected, and Dr. Fowler will be doing for us a long expected and much needed work. The Society proposes to assist him with material collected in this country, and we appeal to members to help in the work. Specimens should be pickled in spirits or formaline. Particulars will be supplied to all those who signify their intention to further this project.

How long will it be before we have established here in Bombay a Department of Fisheries which is doing work parallel to that which is being done in Madras? At some future date, possibly after further costly and abortive attempts to improve our fish supplies, the urgent need for a scientific survey of the marine fauna of the western Coast will be realised. Money spent in investigations which do not immediately yield results in hard cash cause grievous heart-burning in a commercially minded community, yet times out of number investigations of this nature have formed the essential basis upon which many a remunerative and revenue earning industry has been built.

Speaking of revenue brings us to the subject of " revenue and pigs," as the Department of Agriculture, Bombay, has recently published a record of evil doing on the part of that marauding desperado *Sus cristatus* the Indian Wild Boar. Few people are aware of the extent of the havoc wrought to agriculture in this country by wild pigs. That the grievance is acute and calls for immediate remedy is apparent from the amazing statistics provided by the Department. In certain districts the pigs are actually ousting the villagers from their homes, and turning fertile fields into barren wastes. Figures provided by the Department give the best indication of the appalling conditions that obtain in certain areas. Witness the following tabulation of annual damage to crops :—

Konkan	8 to 10	lakhs of rupees.
Thana District	9 to 10	do.
Surat	15	do.
Deccan Canal Areas	1½	do.
Gujerat	30	per cent. of the crop.

The direct damage to the Presidency is conservatively estimated at 70 lakhs, whilst the indirect loss runs into crores of rupees. In most districts sugar cane suffers to the extent of 50 per cent. of the crop, ground-nuts 25 per cent., rice 10 per cent. The Department of Agriculture is devising ways and means to cope with the menace. A war of extermination on a species which is among the most prolific of hoofed animals would be worse than useless. Attention must therefore be directed to the saving of the crops. This is the thorny problem with which the department is now wrestling. Fencing-in of large areas would necessarily be an exceedingly costly process, and would be impossible without liberal Government support. Suggestions which would tend in any way towards the solution of the problem would be welcome.

In connection with the slaying of the mighty boar we have to record with gratitude, that the Society has just received, on deposit, a collection of manuscripts relating to the doings of pigstickers, these being the Records of the Ahmedabad Tent Club, dating as far back as 1858. The entries include such names as "Roberts," believed to be the late Field Marshall, and the manuscript is illustrated with many spirited drawings and sketches. A perusal of these records will we are certain appeal not only to the ardent pigsticker but will also interest a much wider field. They are records of more spacious days when the earning of one's bread by the sweat of one's brow did not apply with such special force as it does to-day. The leisure of the past filled the columns of those now defunct Journals the "Asian" and the "Oriental Sporting Magazine" with lively records and observations on Sport and Natural History by a host of enthusiastic amateurs. To this Society has fallen the privilege of carrying on work which has given joy and inspiration to all who seek and find solace within that fane which is—

"Nature's Cathedral, boundless as our wonder,
Whose quenchless lamps the sun and moon supply,
Its choir the winds and waves, its organ thunder
Its dome the sky."

It is with deep regret that we record the death at Calcutta of Dr. T. N. Annandale, F.R.S., C.I.E., D.Sc., late Director of the Zoological Survey of India and Superintendent of the Indian Museum, Calcutta. Dr. Annandale's contribution to the cause of Scientific Progress in India is appreciated by all who are conversant with his work in this country.

His early demise has deprived the Zoological Survey of India, not only of its founder but also of a distinguished and capable leader.

Dr. S. W. Kemp, the Superintendent of the Zoological Survey of India, writes us : —

> "I shall be obliged if you will convey to the Committee and Members of the Bombay Natural History Society the sincere thanks of myself

> and my colleagues for your letter of condolence in the loss we have sustained by the sudden death of our Director Dr. N. Annandale. By his death we are deprived of a chief who had endeared himself to all his staff by his never-failing generosity and consideration for others. It is only a few years since he succeeded in placing this department on a satisfactory footing and we feel that the loss of his high scientific ability and long administrative experience is an irreparable disaster."

Dr. Annandale recently consented to serve on the Managing Committee of the Society and his loss has deprived us of the benefit of his mature experience and advice.

Our sincerest condolences are offered to the members of his family.

We hope in the next issue to have the privilege of publishing appreciation and record of Dr. Annandale's work in India.

FAUNA OF BRITISH INDIA.

IN the "*FAUNA OF BRITISH INDIA*" Series the further volumes which the Editor, Sir Arthur E. Shipley, with the assistance of Dr. Hugh Scott and with the sanction of the Secretary of State for India, has arranged for, are :—

Volumes on *Butterflies* (*Lycænidæ* and *Hesperiidæ*) by Mr. N. D. Riley : on the *Ixodidæ* and *Argasidæ* by Professor G. H. F. Nuttall and Mr. C. Warburton : on *Leeches* by Mr. W. A. Harding and Prof. J. Percy Moore : on the *Curculionidæ* by Dr. G. A. K. Marshall : on the *Carabidæ* by Mr. H. E. Andrewes : on the *Meloidæ* by Mr. K. G. Blair : on the *Erotylidæ* and *Endomychidæ* by Mr. G. J. Arrow : on the *Culicidæ* by Capt. P. J. Barraud, Lt.-Col. S. R. Christophers, and Mr. F. W. Edwards : on the *Chrysomelidæ* (subfamilies *Chrysomelinæ* and *Halticinæ*) by Mr. S. Maulik : on the *Scolytidæ* and *Platypodidæ* by Lt.-Col. Winn Sampson : together with a revised edition of Mammalia by Mr. Martin A. C. Hinton and Mr. R. I. Pocock and of Birds (6 vols.) by Mr. E. C. Stuart Baker.

26 Nov. 1923.

OBITUARY.

COLONEL CHARLES SWINHOE, M.A. (OXON.), F.L.S., F.Z.S., F.E.S.

There passed away on December 2nd last year one of the eight original members of our Society. The late Col. Swinhoe was born on August 29th, 1836 and at the age of 19 entered the Army as an Ensign in the 56th Regiment of Foot. He reached India just after the Mutiny and joined the Bombay Staff Corps, with which Corps he served until his retirement from the Army 30 years ago. He went through the Afghan War and was with Lord Roberts in Kandahar. On his retirement from the Army he settled down at Oxford, but later on moved to London, where he died.

Colonel Swinhoe was a man of many parts. A keen shikari of the old school, who had accounted for between 50 and 60 tigers; devoted to most outdoor games and sports; interested in birds and a member of the British Ornithologists Union; but it is as an Entomologist that he has attained fame and for many years he has been regarded as an expert on Lepidoptera. During his time in India he was an indefatigable collector, working chiefly in the Bombay, Poona, Mhow, and Karachi Districts and many contributions from his pen are to be found in the earlier numbers of the Journal. After his retirement he devoted the remainder of his life entirely to the study of Lepidoptera and contributed freely to the Annals and Magazine of Natural History. On the death of Frederick Moore, Col. Swinhoe was entrusted with the completion of that magnificent work on Indian Butterflies, Lepidoptera Indica; the portions dealing with the *Lycænidæ* (Blues), *Hesperidæ* (Skippers) and a part of the *Pieridae,* (Whites) were compiled entirely by him. The Heterocera or Moths was, however, the section of the Lepidoptera wherein Col. Swinhoe excelled; of these he had amassed a collection containing 40,000 specimens, comprising 7,000 different species and including over 400 types of new species described by him. He remained active up to the commencement of his 87th year, just prior to which he had completed "A revision of the genera of the family *Liparidae,*" covering no fewer than 1,130 detailed entries.

He was well known as a lecturer on such subjects as Mimicry and was acknowledged as an expert on all matters connected with Lepidoptera by investigators of many countries. For his services to Entomology the University of Oxford conferred upon him the honorary degree of Master of Arts, and the Entomological Society of France appointed him an Honorary Member. But until some future generation throws into the scrap heap our present system of nomenclature, Col. Swinhoe's name will be preserved as the describer of many new butterflies and moths, while many others have been named after him by authors, who have wished to honour a name, that has been pre-eminent among Entomologists for many years.

MISCELLANEOUS NOTES.

No. I.—READER'S COMMENTS ON PREVIOUS NOTES ARTICLES.

Protective Colouration in Wild Animals.

(Vol. XXIX, No. 2, p. 469)

I read with considerable interest the article under the above title by B. P. Tailyour in the August Number of the Journal. The principle of 'Counter-shading' to which he has been led by his observations and experiments is very little different from what the American Artist-Naturalist Abbot H. Thayer discovered in 1896. He called it the Neutralisation of Shadow. Poulton several years before him had recognised the importance of this factor for purposes of concealment in regard to two insects but for the wider generalisation credit is due to Thayer. He published a book on 'Concealing Colouration in the Animal Kingdom' (New York, 1910). I have not read this book but there are copious references in Poulton's papers from one of which the following may be extracted.

"The colours of large numbers of animals are darkest on the back, becoming gradually lighter on the sides, and passing into white on the belly. Abbot H. Thayer has suggested that this gradation obliterates the appearance of solidity, which is due to shadow. A colour-harmony, which is also essential to concealment, is produced because the back is of the same tint as the environment (*viz.*, earth), bathed in the cold blue-white of the sky, while the belly, being cold blue-white bathed in shadow and yellow earth reflections, produces the same effect. Thayer has made and presented models to the Natural History Museums of Oxford, Cambridge, and London, which support his interpretation in a very convincing manner.

"Special resemblances to twigs, upright stems, &c., are, Mr. Thayer considers, represented upon a background in which the shadow is neutralized as described above. Hence the background. *viz.*, the animal's body, disappears, while the markings upon it are alone distinctly seen.

"For ages the artist has known how to produce the appearance of solid objects standing out on his canvas, by painting in the likeness of the shadows. It has remained for this great artist-naturalist to realize the logical antithesis, and show how solid objects may be made to fade away and become ghost-like or even invisible, by painting out the shadows."

I saw the models referred to in the Entrance Hall of the Museum of Natural History, London. They were of ducks against a common back ground. One coloured as the back ground uniformly throughout and the other as in a normal bird and at a certain distance the latter one became invisible while the other was conspicuous.

It will be seen that the principle thus described and illustrated by Thayer is much the same as the one now enunciated by Mr. Tailyour. Mr. Thayer was led to this interesting generalisation from his training and experience as an artist. The credit is, therefore, all the greater to Mr. Tailyour for having arrived independently though much later at practically the same conclusion without any such training to guide him.

Dept. of Agriculture,
Bangalore,

K. KUNHI KANNAN, M.A., Ph.D.

18*th October* 1923.

"STRANGE" BEHAVIOUR OF A PANTHER.

(Vol. XXIX, No. 2, p. 549)

The behaviour of a panther, referred to as "strange" by Mr. Hanhart in his note in the Journal of 25th August last (Vol. XXIX, No. 2), is easily accounted for, and is, I think, not unusual. The animal was merely trying to avoid observation. It was aware that by moving it would at once attract attention, and by remaining motionless hoped to escape being seen. As we all know, it is movement in nature that attracts observation and nullifies the advantages of protective colouration, which is only protective in a state of immobility. I think the behaviour of the panther in question was not strange, but normal. No doubt many animals do escape observation by this means. I saw the same thing in a hen pheasant a few days ago, which was moving in an open stubble field. When it saw me at a distance, the bird squatted with neck extended and head flat on the ground, and did not move until I walked up to within five yards, when evidently realising that it was observed, it took to flight. While still, it was quite invisible.

An experience very similar to that related by Mr. Hanhart occurred to me some ten years ago. I was encamped in a country infested by panthers, when some Brinjaras came with news that they had marked one down, and left some of their people to watch it. I rode out to the spot, and found a grassy nullah with few bushes; the panther was said to be lying under a small bush about forty yards off. From the top of the hill above, the men said they could see the animal, and attempted to point it out to me, but I could not make it out. During this time, the men continued talking, and a dog with them barked at times. I remonstrated with them, telling them not to talk or they would drive the panther away. But one of them explained to me that, on the contrary, if they ceased talking the panther would think they had gone, and would get up and make off. So long as it was made aware of their presence, it would not move, hoping thus to escape observation. It was with some difficulty and after some shouting and throwing of stones that the beast was made to break cover, and was shot.

It is for the same reason that it is advisable, when one is going to sit over a kill or a tethered goat in wait for a panther, to cause one's attendants to move off talking after the arrangements have been made, leaving one in silence and in ambush on the spot. The panther thus supposing that all the people have gone and that the coast is clear will issue forth boldly as soon as the noise has passed out of hearing.

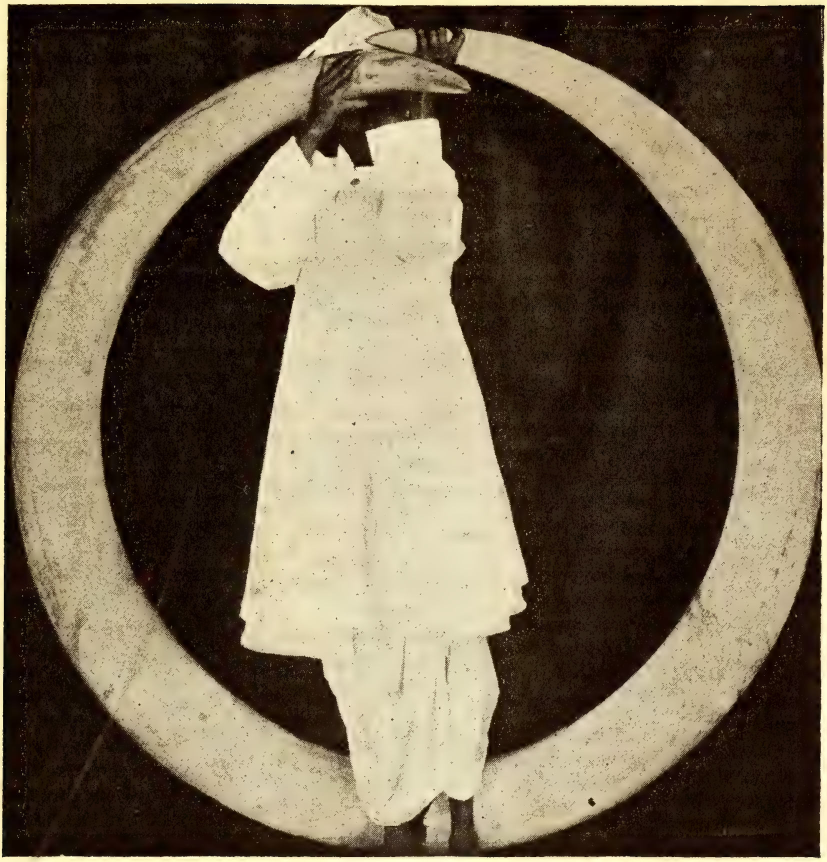
R. G. BURTON,
Brigr.-General.

BAFFORD GRANGE, CHARLTON KINGS,
8th October 1923.

No. II.—LARGE TUSKS OF INDIAN ELEPHANT (*E. MAXIMUS*).

With a Photo.

I enclose herewith two photos of a pair of elephant tusks which were found in the Coimbatore jungles, as I think they must nearly constitute a record fo India, taking all their measurements together with their weight. The tusks wer



dry, and had evidently been lying in the jungle for at least a year, and, as I understand ivory loses 5 per cent., the weight must have been very considerably more when the elephant died. The measurements and weights were most carefully taken, and were checked by two other European planters here.

Right Tusk ..	Length.	7 ft. 8 inches.	Girth ..	$18\frac{5}{8}$	Weight,	$79\frac{1}{2}$ lbs.
Left Tusk ..	Do.	7 ft. 10 inches.	Do. ..	$19\frac{1}{4}$	Do.	$82\frac{1}{2}$ lbs.
					Total weight	162 lbs.

Weights and measurements carefully checked by the following—

E. W. Simcock.
C. L. Napier.
C. R. T. Congreve.

C. R. T. CONGREVE.

VALPARAI, COIMBATORE,
18*th December* 1923.

No. III—IN THE HAUNTS OF THE RED INDIAN WILD DOG (*CUON DUKHUNENSIS*).

As the dawn breaks over an Indian jungle, the glistening whiteness of a small encampment is revealed beneath the fruit-laden trees of a shady mango tope.

Near by is a small village containing about a dozen huts of very flimsy construction and principally built of bamboo. All round are parched fields which spring into life on the advent of the monsoon, and from which the villagers obtain their annual stock of rice.

This tiny hamlet, situated in the eastern corner of the Central Provinces, almost on the borders of Bastar State, is inhabited by a very uncivilised, aboriginal tribe known as the "Mariahs" or "Marie Gouds," whose intellect is akin to their dress in scantiness.

They are, however, a very willing and friendly folk, and are hard to surpass in jungle craft: the way thirty or forty of them will drive game, and particularly tiger, through difficult and broken country, up to some fixed point is quite marvellous; besides which they are gifted with extraordinary powers of tracking.

It was in this tiny camp that I found myself in May 1913, and from the look of the surrounding jungles I seemed to have found a good spot.

Also, on my way there, three miles along the road, between two nullahs which it crossed, were the going and returning "pugs" of a huge tiger, who killed one of my "baits" a few hours after my arrival, but as thereby hangs a tale and this story does not concern him, I must leave him for a while.

These jungles are situated in very broken and hilly country, full of rock-strewn, bamboo-covered ridges of granitoid gneiss, the haunts of countless spur-fowl, sloth bear, sambhur and panther.

Between the hill ranges were expansive valleys—thinly treed, and clothed with a garment of tall jungle grass, in which roamed herds of bison, swamp deer, and pig, with occasionally herds of the mighty wild buffaloes; these valleys were intersected here and there by sandy water-courses and nullahs, the haunt of tiger. Water was scarce. Here and there in the nullahs one would find a pool, and from the countless tracks around it one quickly realized how much it was frequented by all kinds of game. The surrounding country was destitute of villages, the nearest being eight miles to the south west, after which one could go some twelve miles or more in any direction without coming across any human habitation.

As the incidents I am about to relate are connected with one of the watering places near the village, a brief description of it is necessary.

A few hundred yards to the west of the village was a small sandy water course, which turned sharply to the south, and then ran parallel with a jungle road.

About half-a-mile from the village and alongside this road there still remained in the nullah a broad, shallow pool, used daily for watering the small herd of village cattle, and which at night was frequented by some half dozen panthers and various other wild animals. In addition to this, in the vicinity of the village, there were many small pools of water which had been obtained by digging deeply into the sand, and wild animals, if disturbed at the large pool on their nightly visits, would often go elsewhere in this nullah for water.

Previous to this I had often seen wild dogs without getting a shot at them, and my Punjabi Mussulman orderly knew these red brutes well by sight.

Consequently, one morning, I had no doubts about his story when he arrived breathless while I was breakfasting and told me that as he had been washing his clothes at the large pool, a pack of about twenty-five wild dogs had trotted down, and, without paying the slightest attention to him, had first of all slaked their thirst, and then had all lain down in the water with just their heads showing.

Any idea of tackling the rest of my breakfast was quickly dispensed with, and I was soon—shot gun in hand—doubling after my orderly who was carrying my spare weapon—a ·256 Mannlicher. "S. G." and "B. B." were the sizes of the shot I took with me, but I was greatly handicapped by a broken gear-spring in the mechanism of the action of the left trigger, which prevented me from using the left barrel.

On arriving at the pool, which was not more than 60 feet by 30 feet in size, not a sign of a "cuon" was to be seen, and bitterly disappointed, I was about to turn away, when my orderly suggested having a look further in the jungle round the nullah.

I had hardly taken a pace forward into the scrub when tawny forms rose up from the shade of bushes and tussocks of grass, and the whole place seemed alive with wild dogs.

Having read a great deal about the shyness of these animals, I hastily fired a charge of "S.G." at the largest one, but the range was too far to use such pellets with effect which only scattered and did no damage.

Quickly reloading, a second shot was more successful, and bowled over a fair-sized bitch.

Upon this second discharge a huge beast jumped out of the nullah and passing close by me as I crammed in a fresh cartridge, halted a few yards distant presenting an easy target.

Unfortunately I had loaded with lethal bullet, and a snapshot at him proved in vain, for in my eagerness I jerked the trigger and caused the muzzle of the gun to bob down, with the result that the bullet struck the ground beneath the animal's stomach.

It was then that I noticed the curious whistling noise that these animals make when alarmed, and I could hear it all around me in the jungle and on the slopes of an adjacent hill.

Besides this I was rather surprised at the boldness of these "Red Dog" which, even after three shots, showed no inclination to hurry their departure or move very far away.

Consequently, I sent my orderly to round them up and drive them back again towards me from the hill where they had taken refuge.

This manœuvre was very nearly successful, but the "cuons" had just enough start to get ahead of me and making a detour they passed across the road at the village end of the pool and began making their way up the slopes of another scrub-covered hill.

Meanwhile I had noticed three "Red Dog" lying in the pool, and missed one badly with a snapshot from the Mannlicher. Then as the dogs were climbing the northern slopes of the hill, I ran up from the south side, and on ascending a ridge near the top and looking over, I found myself face to face with a large dog which I dropped, and which curiously enough turned out to be in miserable condition. He had a mangy coat, was thin and emaciated in form, and had diseased teeth. Why he had been allowed to live, let alone remain in the pack, I cannot imagine, and I was sorry I had destroyed him, as he might have spread his ailments through the pack with fatal consequences.

By this time it must have been 10-30 and as I did not feel inclined to resume the chase over the hills at that hour, when the heat was distinctly unpleasant, I gave orders to the forest guard to make arrangements for the erection of a well-screened *machan* in a low bushy tree growing at the edge of the water.

In about two hours time it was ready, and in the meantime I had returned to camp.

When my orderly came to call me, he said that the parties of wild dogs had been down to drink and bathe while they were at work.

Consequently, I was hardly surprised on arriving at the pool to see three tawny heads sticking out of the water behind a rock at the farther end.

A charge of " B. B." beyond peppering them did little damage, but I managed by running to cut off one from the hill it was making for, and bowled it over with a lucky shot—not quite good enough however—as he got up and limped off on three legs in absolute ignorance of the direction of his aggressor.

Unfortunately, he saw me a few minutes later, and in spite of his wound was off at a great pace and soon was lost to sight in the tall jungle grass and thick scrub.

After this disappointment and strenuous chase, I returned—hot and exhausted—to the *machan*, but for a long time there were no further signs of the " cuons."

About 3-45 however, a movement to one side attracted my attention, and I observed five reddish forms stealing along over the slippery, black rocks at the north end of the pool. But what a change from the bold, devil-may-care-attitude previously adopted by these animals. Now they come slinking cautiously along, ears pricked up and attentive for the least sound, eyes searching in every direction, now and then a pause, and last of all a careful look round as they reached the edge of the inviting pool. I looked again, this time along the sights of my gun ; all I could see were five tawny heads grouped close together sticking out of the water. Bang ! Five writhing forms are down in the shallow pool, but such a bag is too good to be true, especially with a single barrel; and almost immediately, two of them, only slightly peppered, jump up and scamper away, while a third, in spite of a broken shoulder, makes off at a great pace.

The remaining two, however, are powerless to get away, and a couple of bullets from a ·22 bore rifle speedily put an end to their sufferings. Not so bad after all, but what a triumph it would have been if I had had a second barrel to follow up my first shot.

After this, I left the pool alone for the day and early next morning, as usual, went for a long ramble in the jungle, but I had left a watcher at the pool, who, on my return reported that he had seen three wild dogs. Accordingly, later on in the day I again took up my position in the hide, and about midday the member of the luckless party of five of the previous day, who had retired with a broken shoulder came limping along and crept towards the pool with the utmost wariness.

Although he did not detect me, he was very suspicious. As he paused at the edge of the pool, he was struck by a charge of " B.B." and rolled over into the water, out of which he scrambled on to the hill side, and fell dead after going twenty paces.

The same evening I was sitting over a goat for a panther when two wild dogs came down to drink at dusk. I had a shot at them, but both got away without serious injury, although knocked over and well peppered by the charge.

The last glimpse I had of the remnants of the pack was on the following morning as I passed the pool shortly after dawn. For I observed half-a-dozen reddish hued forms stealing away through the clumps of bamboos which grew in profusion on the slopes of the hill to the east of the watering place.

In passing from this subject I can only add my regrets that I had not doubled or even trebled my bag as the red dogs are an absolute curse in the jungle, and they are the most ruthless destroyers of game that exist. So bad are they that in the Central Provinces a reward of Rs. 15 each is given for wild dog, while in the United Provinces, both the Civil and Forest authorities give rewards for their destruction.

One rarely gets such opportunities with a pack of "cuons" and if only I could have followed up every shot with a second barrel, I would have inflicted infinitely more damage on the pack.

C. R. S. PITMAN.

KENYA COLONY, EAST AFRICA,
12th September 1923.

No. IV.—A NOVEL METHOD OF SHOOTING BLACK BEAR IN THE "GALIS".

Finding myself at Nathia Gali in the Murree Hills at the end of June 1912 with a few days to spare on my hands, I looked about for something to shoot. Having ascertained that at Dunga Gali, 2½ miles away, there was a shikari of sorts, I sent for him and discussed the prospects of bagging a bear within the next week or so.

I was shown a long and well-wooded nullah which ran down some thousands of feet to the Jhelum River, and was told that bear would certainly be found there, but were not likely to be obtained unless I cared to kill an ox and leave the carcase in a certain favourable spot, known to the shikari, some way down the khud.

Having purchased the bullock, I left the whole of the bandobast in the hands of the shikari who proceeded to tell me that Major . . . . last year had managed to bag no less than four bears over oxen he had killed, and placed in the same spot where mine would be.

Pleased at the prospect of a new form of shikar I returned to my headquarters and waited for news. On June 24th the carcase was placed in the forest, and that night a bear came round and inspected it; but did not summon up enough courage to tackle it until the night of 26th June.

Being informed of this, I determined to sit up over the carcase the next night.

I arrived at the spot about 6 p.m. and saw that the head and one of the shoulders had disappeared and that a large portion of the neck had been eaten.

At that time there was a bright moon and at 9 o'clock I heard a bear below on the khud side but he had evidently got hold of a shoulder or the head for I was entertained for a long time with the sounds of crunching and cracking of bones, and then when he did start off for the carcase he must have winded us from the slight breeze which was blowing, and moved off again without showing himself. Later, I heard another bear moving about, accompanied by a couple of cubs, but they also eventually went off down the nullah.

The next night saw me again in the *machan* and on my way to it I came across the fresh and unmistaken traces of a panther.

He had evidently inspected the carcase that evening, but as he was not likely to touch the putrid remains unless very hard pressed for a meal, I was rather anxious to see if he would turn up that night.

And turn up he did, for at 8-30 that evening I detected a slight movement, and heard the snapping of a few twigs as he took up his position beneath an adjacent bush, and broke the stillness of the night from time to time with an occasional rasping sigh.

I wondered what he intended. Was he wanting a meal, and having winded us, was awaiting further developments, or did he think that the old bear with cubs would come along, and that while she was busily engaged at her nasty feed he might have a chance of abducting one of the plump little youngsters ?

At any rate there he sat and about an hour later an old bear came bustling down the hill from above me straight towards the carcase.

But no ! he winds the panther and with a frightened "woof" crashes away down into the rocky nullah. Soon afterwards "Spots" tires of his task and silently wends his way up the hill, and another profitless vigil ends with the chilly dawn.

I told the shikari that I should not sit up that night, but to cut up the remains and strew the surrounding forest with tempting morsels.

This apparently had the desired effect for the next day I heard that nearly the whole of the ox had been eaten and that the panther had again been in the vicinity. The moon was now rising later and later and, on arriving at the machan that night, I quickly realised that it would probably be my last chance.

Soon after I took up my position on the springy platform of fir branches I heard a couple of martens fighting in a blasted pine which towered above me.

As I waited and watched, I pondered over the chances of getting a shot that night, and as the hours sped by I began to give up all hope.

But it was still early and at 10-30 I heard the welcome shuffling sound close by and below me.

Holding my breath I waited ; I dare not raise my hand to keep off the myriads of mosquitoes which took this opportunity of launching a determined attack on me.

A branch cracked, some leaves rustled, and my aching limbs had to be eased : the shikari scowled at me, but to no purpose : I had to move, but still the bear shuffled on. A sound of bones being cracked showed me that he was for the time being occupied with morsels previously dragged away from the carcase.

When he had been shuffling around for nearly an hour, he suddenly bestirred himself, and with the utmost caution approached the open space where lay the few remaining pieces of bullock.

A final crash as he burst through the thick bushes, and I perceived a black form waddle towards the carcase and sniff it.

Unlike the semi-blind and almost deaf Sloth Bear of the Indian Peninsula, these Himalayan Bears are possessed of all their faculties.

Consequently I drew a bead on him at once, and waited till he should offer a broadside shot.

As I watched, he turned towards me and presented quite a good target and the contents of my first barrel, loaded with lethal bullet caught him in the shoulder, and bowled him over. The second barrel unfortunately was not so successful as he lay kicking on his back, and before I could reload, he had picked himself up and flung himself over the steep khud, where I heard him crashing down through the bushes and undergrowth into the nullah below.

It was impossible to follow him up at once, and I had to content myself till dawn with the thought that he was badly wounded and could not go far.

But all kinds of bear are possessed of wonderful vitality and I was doomed to disappointment.

When light came the trail was quickly picked up and from the marks and blood it was at once evident that a badly smashed shoulder was the damage.

For over two miles we followed these tracks, and then found ourselves utterly at fault when we arrived at a small mountain torrent.

Casting round in circles was of no avail, for the luckless bear had made good his escape.

In all probability he had washed his wound in the water, staunched the flow of blood, and then plastered it with leaves and mud, and so got clear away, without leaving a trace behind him.

C. R. S. PITMAN.

KENYA COLONY, EAST AFRICA,
14*th November* 1923.

No. V.—BLACK-BUCK AND JACKAL.

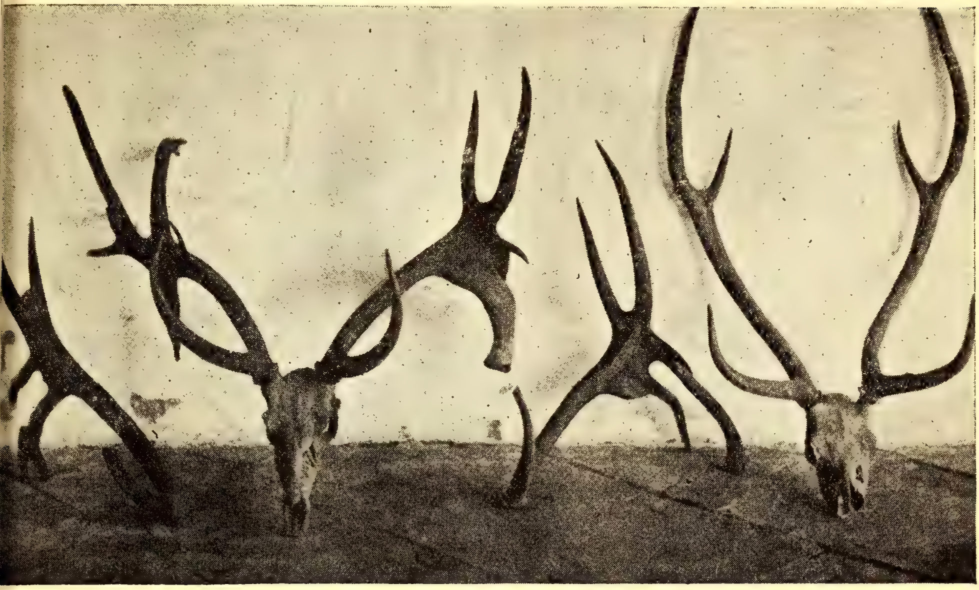
An incident of interest which I saw a short while ago, was as follows :—I was after Black Buck in fairly open country near Nabha when I saw a buck being chased by a single jackal. The buck must have had something the matter with its leg, although it ran very fast, for the jackal succeeded in catching it up and pulled it down three times single handed. It always went for the back part of the stomach and eventually disabled it. I went up and shot the jackal which was quite a small one, and finished off the buck which could not move. I could not find any visible signs of any previous injury on the Black Buck which would account for its lameness.

L. G. W. HAMBER, CAPT.,
1/1st K. G. O. Gurkha Rifles.

NABHA STATE, PUNJAB,
26*th November* 1923.

No. VI.—MALFORMED HORNS IN THE CHEETAL (*AXIS AXIS*).

(*With a photo.*)



No. 2. No. 1. No. 2. No. 3.

No. 1. Malformed horns of the cheetal (*A. axis*).
No. 2. 2. Picked up antlers of the same animal shed in the preceding year.
No. 3. Normal horns of the cheetal for comparison.

I send you for publication, a photograph of a freak of nature in the way of a pair of Cheetal (Spotted Deer) horns.

I first observed the stag carrying these about the end of April 1921 when I was shooting in little visited shrub jungle in the hope of securing one of the good heads I knew were there.

I shot a stag in very open jungle and the report of my rifle put up 7 hinds and a stag (this freak). The stag ran to my left and stood on a ridge barely 100 yards away and I could not but immediately notice the extraordinary horns. He gave me a splendid shot (broad-side), but I missed him and later discovered that the second leaf of the backsight was up. I promptly followed the herd and saw them crossing a piece of open for another patch of jungle and emptied my magazine on the stag but with no result. I continued following and came across the stag who had his horns badly entangled in a big "Karonda" bush and was making frantic efforts to get loose, but before I could get round for a shot he disentangled himself and disappeared, and though I searched the jungle thoroughly in a scorching sun all day, I did not see him again on this occasion.

On another visit to the same jungle I did not come across this stag but on a third occasion I saw him again and this at the end of the day when I had given up all hopes as I had worked hard in a thorough search of the surrounding jungles.

I was returning to my Headquarters through the jungle, when I saw a couple of hinds with a good stag looking at me and shot the stag, and when they made off I discovered to my chagrin that the object of my search was in the herd. I took a running snap shot but another Cheetal (female) intercepted and so I again lost the trophy; the possession of which had now become an ambition if not an obsession. Unfortunately, I did not get an opportunity to go out again.

In August I sent my Shikari out to see if the stag was still there and report on the condition of his horns and he brought in the horns numbered (2) the photograph of which I send, picked up by a grazier not far apart.

From then onward I had him very closely watched to see if he would grow freak horns again which he did and in April 1922, having been informed that his horns were no longer in velvet, I went out and shot him with the horns numbered (1).

Quite apart from being an abnormal freak, it clearly establishes that freak horns are permanent and not only confined to one set. I may mention here that beyond this freak, the stag had no other visible defect about him which I could detect.

The horns numbered (3) are those of a natural head, (36¾″) in order to show the vast contrast.

B. A. PARR,
Inspector of Police.

HOSHANGABAD, C.P.,
November 1922.

No. VII.—SOUTHERN RANGE OF THE MALLARD (*ANAS BOSCAS*).

A Mallard was shot by Mr. Borrisow near Taluja (Panwell, Bombay) on November 17th. It was a male bird but the curl of the tail feathers was only just beginning. The bird seemed in good condition but allowed us to get very close before rising, which was all the more surprising because we had been shooting snipe within 50 yards of the bunch of reeds from which we flushed him. Mr. Borrisow shot the same ground a week later and saw another Mallard.

J. R. ABERCROMBIE.

BOMBAY, *8th January* 1924.

A drake Mallard, a solitary bird, was shot on Xmas day at Palam tank, about 5 miles from Bulsar. This I believe is further south than Stuart Baker records its occurrence.

I obtained a solitary drake Mallard about a week earlier at Maroli, 30 miles from here, on the same tank where Mr. Ball of the B. B. & C. I. Railway shot one a year ago.

T. F. G. SHEPHARD.

BULSAR,
B. B. & C. I. RAILWAY,
27th December 1923.

Stuart Baker's book on Indian Birds does not record the "Mallard Duck" in this part of the world. I shot one at Pali (35 miles from Jodhpur) on Sunday, the 16th instant. It may be of interest.

MAJOR-GENL. H. D. WATSON.

JODHPUR,
18th December 1923.

No. VIII.—NEST OF MRS. GOULD'S YELLOW-BACKED SUNBIRD (*ÆTHOPYGA GOULDIÆ*).

I obtained the nest and eggs of this bird in April 1923 and later in the year I showed the eggs to Mr. Stuart Baker who kindly fixed their identity for me. As I was unable to find any description of the nest one may perhaps be useful. On my describing it, Mr. Stuart Baker showed me a painting which left no doubt about it.

The nest is pear-shaped and was suspended from the end of a stem of wild raspberry and beneath the two last leaves on the stem. It was composed entirely of cotton silk or vegetable down. The whiteness of this material showing above this stem would attract attention and to conceal it the bird had fixed green creeping moss over it of the same shade as the raspberry leaf. This green creeping moss was also used like filigree work over the body of the nest to keep it together. There was only a suggestion of a porch over the entrance hole which was ⅔rds of the way up. The material being so flimsy the bird had herring-boned the lower edge of the entrance hole with the same green moss doubling it over the edge so as to form a sharp firm edge. The eggs were typical *Æthopyga*, spotted with greeny brown principally at the larger end where they formed a thick circle, they measured ·65 by ·48 mm.

S. M. ROBINSON, M.B.O.U.

No. IX.—NESTING OF WALDEN'S YELLOW-BACKED SUNBIRD (*ÆTHOPYGA SANGUINIPECTA*).

On seeing Mr. Stuart Baker at home I told him I had obtained this bird and its nest and eggs at Thandaung in the Karen Hills east of Toungoo. He said the nest and eggs had never previously been obtained and I apologize for not having sent in a description before. I obtained them on 20th April 1923.

Nest.—Pear-shaped entrance ⅔rds of the way up with only a bare suggestion of a porch. It was composed of dried grass stems lined heavily with silky white grass down and decorated outside all over with chips of dealwood, bits of dead bamboo and bamboo leaf. It was suspended from the end of a wild raspberry stem. The eggs are dull white spotted all over with greeny brown spots which are thickest at the larger end where they run into each other and form a circle. The eggs measure ·69 by ·48 mm.

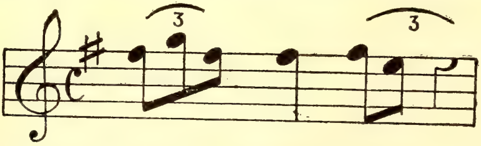
S. M. ROBINSON, M.B.O.U.

January 1924.

No. X.—NIDIFICATION OF THE WESTERN SPOTTED BABBLER. (*P. RUFICEPS JONESI*)

In the Fauna of British India—Birds—Vol. I (second edition) at page 242 under *Pellorneum ruficeps jonesi* (the Western Spotted Babbler) the note occurs "Nidification unknown." As I have found several nests of this babbler in the Dehra Dun, where it is a common bird, I write to record the fact.

This Babbler is found throughout the better wooded portions of the Dun. It is specially numerous in the wooded ravines and in the tea gardens close to Dehra itself. The male bird has a very pretty short song of six clear notes, frequently repeated which may be musically represented as follows :—



The birds are shy and spend most of their time moving gently about among dead leaves on the ground. They occur singly or in pairs and are not gregarious. Nidification commences early in April.

On April 19th, 1916, I found a nest at the foot of a tea bush (Kowlagarh Tea Estate) close to Dehra. It contained 4 incubated eggs.

On April 24th of the same year I observed a pair of birds building their nest on the steep bank of a ravine. The nest was on the grounds, well concealed among dead leaves.

The same day in another ravine I came on a brood of young birds which had only recently left the nest. The mother bird appeared on the scene and came within two or three feet of me as I sat near the nest with one young bird in my hand. She moved round me almost like a mouse, but with wings expanded and feigning a wound.

Nests were all very loosely constructed and domed with a large lateral entrance. The nests, as well as the eggs, much resemble those of *P. ruficeps ruficeps* subsequently found by me near Pachmarhi in the Central Provinces. Unfortunately I cannot give detailed descriptions of the eggs with measurements as I have not got the eggs by me.

RAWALPINDI, B. B. OSMASTON, I.F.S.
3rd February 1924.

No. XI.—MIGRATION OF EAGLES.

On the 9th of November 1923 I was at a place called Jathingri in the Mandi State, about 70 miles east of Dharmsala, and witnessed what could only be a regular migration of eagles. At about 3 p.m. I noticed four birds passing over the State bungalow at intervals of about a minute or two each. Later on I went down the spur in an easterly direction and again noticed birds passing in the same direction at short intervals. All came from the same direction and followed exactly the same line of flight. I went along the ridge for a couple of miles or so and took up a position on a point where the spur was quite open and overlooked a small village and fields, and watched very carefully each bird as it passed me. Occasionally two came very close together but for the most part they followed each other at intervals varying from one to four or five minutes. Each succeeding one followed its predecessor on practically an exact alignment. Each passed me on a line about 15 yards to my right as I sat and some 100 yards above me. Every bird flew with wings about quarter flexed as though breasting a strong wind and with tail widely spread. I had shot a Kalij pheasant and a chikor on my way down and tied each at the end of a long string and threw them out in opposite directions, and while well concealed myself kept on tugging at the strings and moving the two birds as I saw an eagle approach. They took not the slightest notice though they could not have helped seeing them. A sparrow hawk came down and bound to the chikor and I felt certain that she would attract an eagle, as any smaller bird of prey with a bird in its talons has an irresistible attraction for any of the eagle tribe. Two passed overhead while the sparrow hawk struggled with the chikor which was being pulled over rough ground at the time. The first took no notice whatever, but the second showed a small amount of interest, as I distinctly saw the head turn and it kept its eye on the hawk and the chukor, even after it had passed well over them, but it did not check its flight in the smallest degree and followed steadily in the wake of the others.

I did not count them but quite 40 birds must have gone over from the time I left the bungalow until nearly sunset.

With but two or three exceptions every bird appeared to be very dark in colour, and the only one that came directly over me was quite black and might have been taken for a Black Eagle (*I. malayensis*) except for the typical short tail of the true Aquila and the heavier flight with wings held in a line with the body. The two or three light coloured birds I at once put down as young Imperial (*A. heliaca*) in the lineated plumage but the dark birds defeated me entirely. Unfortunately they passed between the sun and me so just when I could have seen them best the underside of the plumage was in deep shadow.

I looked hard for any sign of white on the head or the tail bar of the typical Imperial but could not definitely make it out, owing perhaps to the position of the sun. The flight looked very much that of the Spotted Eagle (*A. maculata*), especially on account of the wide spread tail, a characteristic of the latter.

but in that case the light coloured wing patch would have been in evidence in at least some of the birds. Not one of them came within even a very long shot or I should have tried to shoot it and make sure of the species.

The following morning I left Jathingri for Dharmsala and kept an eye open for some sign of the birds I had seen the day before but only met with two during the whole day and both of these were typical Steppe Eagles (*A. bifasciata*).

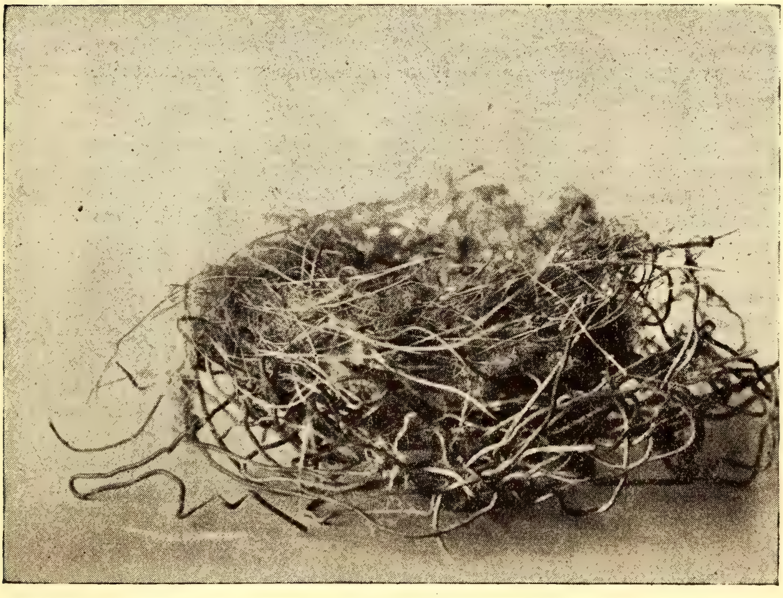
The birds must have been the Imperial (*A. heliaca*) though I could not be sure of the fact. That they were true *Aquila* I have not the smallest doubt and the very dark colouring at once eliminates all the species of that genus save *chrysaëtus, heliaca* and *maculata.* The flight and longer tail of the former at once puts him out of count and leaves us with the two latter. As *maculata* is not a migrant and distinctly uncommon in the hills, I cannot help thinking it was a migration flight of the Imperial (*A. heliaca*) that I witnessed. Of course the evidence is not good enough for a definite record, but is certainly in favour of the last named species.

I had seen one or two Imperials around the station previous to that date and I have not seen very many more since, perhaps a dozen in all, though Steppe Eagles are now fairly numerous.

Hume in his Rough Notes (p. 146) quotes, Capt. Hutton as saying that he has witnessed great flocks of *A. bifasciata* passing Mussoorie during their autumn migration and if any of our members, who have seen similar sights, would be so good as to send in a record for the Journal some very interesting data might be collected. The direction of flight was approximately E. N. E. to W. S. W.

DHARMSALA CANTT. C. H. DONALD, F.Z.S., M.B.O.U.
KANGRA DISTRICT, PUNJAB.
November 20th, 1923.

No. XII.—WIRE NESTS.



DOVE'S NEST MADE OF WIRE.

During the Great War a number of Germans were interned in the Wellesley Barracks (Old British Infantry Lines) at Ahmednagar.

The Barracks were then surrounded by the usual high barbed wire fence.

In 1921 this fence was dismantled and the materials sent to Bellary for the Moplah Prisoners Camp there. The small fragments of binding wire were left lying on the ground.

In the Autumn of 1923, during the Military reliefs, owing to the incoming regiment arriving some months before the departure of the outgoing one, the Wellesley Barracks had to be temporarily occupied, and when they were being repaired, it was found that the local doves had been making their nests of the wire cuttings. The nest is usually very well and closely woven with considerable ingenuity, and the birds must have amazing strength of beak to bend the wire.

There is usually a very thin filling of dry grass and down on the inside.

Sixty-seven of these nests were taken out of one Barrack alone.

W. P. PAKENHAM WALSH,
MAJOR, R. E.,
Asstt. Commanding Royal Engineer, Poona.

POONA,
10*th November* 1923.

Wire is often used in nest construction by crows and kites. There is the classic instance of a pair of crows who built up a home with gold and silver spectacle rims, stolen from a local firm of occulists.—EDS.

No. XIII.—THE INCUBATION PERIOD OF BULBUL'S EGGS.

There is hardly any definite record regarding the period of incubation for Bulbul's eggs. Field observation in this respect does not exist. Oates, in Hume's " Nests and Eggs " makes no mention of it. Two contributions, however, one by Mr. Teschemaker and the other by Dr. Amsler, in the Avicultural Magazine (third series, Vols. I and II,) supply us with aviary notes on this point. But the conclusions therein seem to be vitiated by imperfect records and defective calculation, and I should like to examine the two notes before I put down my own observations.

To fix the incubation period of eggs correctly we should first of all remember one thing. There are some birds—game birds and domestic fowls for example—that lay the full complement of eggs before they begin to sit. But the majority of birds begin to sit as soon as the first egg is laid. It may be that many do not sit as closely on one or two eggs as when the full clutch has been laid. Even in that case some amount of incubation occurs and this has to be taken count of in determining the period of incubation. Those who keep canaries know full well that these birds begin to sit as soon as the first egg is laid. So that those who want to ensure simultaneous birth usually employ dummy eggs until the full clutch is complete.

Two eggs are not laid simultaneously. When one is laid some time must elapse before another appears. If the intervening period be 24 hours, then the incubation of the first egg begins so much earlier. The result naturally is that the first egg hatches out one day ahead of the second and so on. All the chicks do not appear simultaneously; they cannot, simply because their incubation does not begin together. Sometimes, of course, two chicks may be found to have been hatched out on the same day. But in such cases also, there is always a difference of a few hours in their birth which escapes our notice. In determining the period of incubation, one has to count from the date when an egg is laid to the date when that particular one is hatched. Both Dr. Amsler and Mr. Teschemaker suppose that Bulbuls begin incubation with three eggs, as if the birds think one or two eggs too small a number for such an important task!

Of the five broods raised by his Bulbuls (*Otocompsa emeria*), Mr. Teschemaker kept record of one case only. Even in this one case the eggs hatched out—to quote his own words—"in the unusually short period of nine days." He says, " Once more three eggs were laid and incubation commenced on the 14th July. . . . . Two young hatched out on the 23rd." It may be asked, when were the three eggs laid—how long before " incubation commenced on the 23rd ?" Without the dates when each egg was laid, we cannot fix the period of incubation. We do not believe that the eggs hatched out after nine days' incubation. Even during a heat-wave in India, the eggs of Bulbuls require more than nine days' incubation. Mr. Teschemaker evidently made some mistake.

Dr. Amsler's records are more numerous but they are alike inconclusive. His pair of Bulbuls—they too were *Otocompsa emeria*—raised four broods in one season. The periods of incubation were, " fourteen days in the case of the first and last, and ten days in the case of the second and third nests." From this record we cannot say what is the 'normal' period of incubation for Bulbuls' eggs. Let us examine his records. The very first case would show that his method of calculation was wrong.

" The hen laid her first egg on the 25th (May). She started sitting on three eggs and laid a fourth egg on the 28th. She hatched out her first and only chick on the 9th June. One egg had disappeared, one turned out to be clear and the fourth a dead chick."

The above statement shows that the bird does not wait for the completion of a clutch before she decides to brood. Dr. Amsler might have noticed it to sit closely on three eggs but it is possible—and natural—that the bird commenced sitting even on the 25th when the first egg was laid. Of this case Dr. Amsler says that the period of incubation was fourteen days. But how does he calculate it ? We may assume from his account that the bird laid one egg each day on the 25th, 26th and 27th and that she began sitting on the 27th. He says the chick appeared on the 9th June. Leaving out the 9th June, the period of incubation, we get, is—from the 27th May to 8th June—*thirteen* days and not *fourteen.* Even this period cannot be definitely stated to be the incubation period for the egg that hatched out. Which egg was it that hatched out on the 9th June ? Between 25th and 28th May four eggs were laid. The doctor does not appear to have marked the eggs as each was laid, which alone would have ensured accurate calculation. Who can say that the chick in the above case did not come out of the fourth egg which was laid on the 28th ? In that case the period of incubation would become twelve days.

Let us now consider one of those cases in which the period of incubation was ten days according to Dr. Amsler. That was the period for the second and third nests. This is what he says of the third nest. " On July 31st, the hen was again sitting on three eggs, which all hatched out on August 11th and 12th." The very fact that they were hatched out on different dates shows that their incubation also began on different days. otherwise they would have come out on the same day. This point escaped his notice. In the above case, evidently he counts the first ten days of August and puts that period down as the incubation period. But why should he leave out the 31st July when, he says, the bird began to sit? Does not incubation begin as soon as the bird begins sitting ? And why should he leave out of count the 11th of August for the eggs from which the chick appeared on the 12th. The young which was hatched out on the 12th was incubated upto the 11th. From the 31st July to the 11th August it is twelve days. The eggs that were hatched on the 11th were incubated upto the 10th ; the period would be, from the 31st July, eleven days. Yet Dr. Amsler makes it out to be 10 days ! Certainly, this sort of calculation is defective, if not arbitary.

I shall now give my own observations. A pair of White-eared Bulbuls *Molpastes leucotis*), in my aviary, nested four times. Their first clutch consisted of three eggs on which the hen sat and sat for three weeks when I removed them and found them to be clear ones. Immediately after, they built another nest in quite a large basket, full of straw which I had hung up for the use of a pair of White Doves. In this straw the Bulbuls inserted a very neat and compact cup of coir-fibres. I might mention, *en passant,* that they were not at all shy at this time and quite frequently came close to me to take the coir-fibres which I would throw to them, sometimes even accepting them from my hands. Between the 18th and 20th April the hen laid three eggs, one on each day. On the 30th April, I looked in but found no young. On the 1st May I could not inspect the aviary. On the 2nd I discovered two chicks. The egg laid on the 18th proved to be clear. The egg laid on the 19th probably hatched out on the 1st May—the day when I failed to look in, and the egg laid on the 20th hatched out on the 2nd. This makes the period of incubation 12 days. That this is the period of incubation is more convincingly proved by the more accurately kept records of the subsequent two nests which I give below. Of the next two nests I kept exact records, and the reader will find a remarkable coincidence in their dates. I should mention here that I missed the nestlings of the second nest a few days after their birth.

After repairing the same nest, the hen again laid an egg on the 17th June. On the 18th there was another and on the 19th yet another. No more eggs were laid. On the 29th June the first young hatched. Another young came out on the next day and the third egg became addled. Here the period of incubation was exactly twelve days. Going into the aviary one morning, I found a cock Dhayal most enthusiastically trying to breakfast on a young Bulbul. My entrance drove him off and I took up the half-dead thing to restore it to its nest, which I found to be empty. On looking round I discovered the other chick in a corner, pecked out of life. The cause of the disappearance of the first batch of Bulbul nestlings now became apparent to me and I removed the Dhayals to another compartment. It was well that I did so, for the next batch of nestlings lived and throve and are now quite a healthy and lively pair of inmates of my aviary.

After the above disaster, the Bulbuls left the basket and built a nest in a German Roller Canary cage. On the 17th July, the first egg of the fourth clutch was laid. On the 18th there was a second and on the 19th a third. Again on the 29th the first egg hatched out. Two other nestlings followed consecutively on the next two days. A comparison of the dates of the last nest and this one reveals a remarkable coincidence. The third and the fourth nest, therefore, definitely settle for us the period of incubation. According to Dr. Amsler the period was 14 days in two instances and 10 in the other two of the four nests made by the same pair of birds. In the case of my birds I found no variation on three successive occasions. Dr. Amsler's bird laid four eggs on three occasions and three on one. But my bird kept on to three eggs every time.

Now I shall cite an example from Nature. In my country-house at Agarpara seven miles from Calcutta, I discovered, in a bush, a nest of the Bengal Red-Whiskered Bulbul (*Otocompsa emeria*) on the 15th April last, with one egg in it. On the 17th, there were three eggs in it. On the 28th April there were three nestlings in it. Counting from the date the last egg was laid—the 17th—to the date when the last young appeared (the 28th) the period of incubation is eleven days, a day less than the time required by the birds in my aviary. But I must mention that at this time a heat-wave was passing over the country, the maximum temperature recorded in the shade having been 106°F. The normal period, of incubation for the eggs of Bulbuls is, according to my observations, *twelve* days.

SATYA CHURN LAW,
M. A., F.Z.S., M.B.O.U.

CALCUTTA, *5th January* 1924.

No. XIV.—A NOTE ON THE WHITE-BELLIED SEA-EAGLE (*HALIAËTUS LEUCOGASTER*).

In the Fauna of British India (Vol. III, p. 368), Blanford quotes Legge and says of *Haliaetus leucogaster*, "legs and feet whitish." Jerdon describes them as "dirty white." During my stay at Vizagapatam last year, I had, for over two months, a pair of the White-bellied Sea-Eagles under observation. I noticed that the legs and feet were of a pale brick-red colour; even the feathers on the upper tarsus were tinged with the same colour. The Calcutta Museum possesses two specimens of these birds one of which has its legs of a reddish colour. Legge says that the legs and feet of the unfledged nestling are fleshy white but the yearling has its legs as in old birds. That neither of the two birds I saw was very young is indicated by their tails which were black at the base and white at the terminal, the position of the tail colours being the reverse in young birds. It would be interesting to know whether young birds have, at any stage of their life, reddish legs and feet which gradually change into dirty white.

One evening in October, the peculiar clanging call of the birds attracted my attention. I traced them to a tree—a stone's throw from my bungalow—that towered over its neighbours. In the very topmost branch—a dry, leafless one—the birds were sitting, occasionally shifting their position and uttering their loud, far-reaching cry. Evidently, they were retiring for the night. Every evening I used to notice them there and at roosting time they would become very noisy.

In the morning the birds would leave the shore and sweep far out over the sea, occasionally making a straight dive downwards with lightning rapidity to bear away, from the surface of the blue water below, a fish or a sea-snake. Snakes seem to be a very favourite food with them and they have a special knack of fishing up these reptiles from the troubled billows. Towards mid-day, they would return inland and, rising to an enormous height, soar majestically in circles with motionless wings. Looked at from beneath, their white belly contrasted well with the black of the wings and tail, the black of each appearing to run into the other. In this position they might easily be mistaken for vultures, but for their call which were frequently indulged in. Another pair of the same species used to join them at such times. This pair, I discovered, had their home in the hills that enclose the Valley Gardens behind the Dolphin's Nose. The four of them used to be very noisy. Their *quang quang quang-a-quang* notes coming, as they did, from a height of at least eight or nine hundred feet, would recall to one the collective voice of a flock of geese. At noon I invariably found the pair near my residence silently perched on the top of some giant tree, lost in a mid-day siesta. But when the sun had crossed the meridian, they would become active again. I did not find them to be very shy; they allowed me not only to approach up to the tree on which they were sitting, but gave me considerable time to scan them well with my field-glass.

S. C. LAW, M.A., F.Z.S., M.B.O.U.

CALCUTTA, *6th February*, 1924.

No. XV.—FLIGHTING ON A DELHI JHEEL.

This is one of a series of incidents that occurred to me at Xmas 1923 and is presented simply with the object of obtaining the solution to a problem of duck movement of some interest to those who shoot discriminately, and whose larder is designed to receive only the best that nature can provide. It concerns primarily the Pintail and unavoidably a variety of other duck which crossed the sunset to their undoing.

My venue was a jheel; let that be sufficient—else may the place next year be a seething mass of sportsmen of keenness unqualified and precocity outrageous.

It lay North and South, in length 600 yards, in breadth 100 yards, in depth 6 inches shelving gradually to 2 feet in the centre where the sedge and grasses yielded to disclose two handsome stretches of open water. It is on one side of these stretches that the guns are finally posted to await the duck which aim for and settle in the open before paddling silently to the shallower feeding stretches at the edge. The jheel was surrounded by a fringe of full grown sugar-cane.

Follow then the attention of the guns as they watch the last rim of the sun disappear beneath the horizon and as they regard the clouds collected at its point of departure with considerable disfavour. They value each precious minute of the time during which the duck will come and they grudge even the clouds their marvellous colourations and conformations when such may seem likely to curtail it. Within a few minutes the ball opens with a *battue* at flights of Brahminy quartering the ray-striped sky with their discordant notes in search of food and safety. They flew too high even for No. 2 shot and passed apparently unscathed through patterns of S. G.

It was decided now that the guns should move out from the sheltering cane to patches of dry land at the sides of the open water furthest from the sunset to await the flighting. In due course the duck came in their whistling tumble from the sky and the night rang with the sound of repeated shots. Alternate explosions and the scutter of rising duck, which had flown in unseen, intermingled with the whistle of newcomers and the occasional splash of a dropped bird is the best description I can give of moments which remain a confused turmoil in my memory. One was continually whirling round to a new sound, straining one's eyes to an object that defeated them, and finally—silence. Night had fallen, the duck had settled and there remained only the collection and classification of the bag ; this latter was achieved by the light of motor lamps and it is herein lies the problem. Fifty per cent. of the bag was composed of that delectable duck the Pintail. On the particular occasion of which I write the remainder were :—1 shoveller, 2 widgeon, 1 common pochard, 1 female of the red-crested pochard. On subsequent occasions also Pintail formed the greater proportion of the total, whereas on other jheels under same conditions not a Pintail was obtained. Do the different species of duck utilize certain water as of habit developed immediately upon arrival and carried through either until the food supply ceases, or the water becomes unsafe and unsatisfactory ? Or does the explanation of this curious segregation of species lie in the fact that the different ducks require different food and conditions of enjoying it ? As an instance of the poetic influence of Xmas fare, I venture to reproduce with the author's permission his description of the same incident—

A FANTASY FOUNDED ON FACT.

This is the tale of a darkling jheel,
Where pintail, pochard, mallard and teal,
Brahminy, widgeon, shoveller feeds,
Holding high revel among the reeds.
The sun has set in an angry West ;
The snipe have flown to a fitful rest.
In the deep cane-coverts that flank the edge
Of their feeding grounds in the grass and sedge.
Slowly the flame-light Westward cools ;
On cane-brake covert and glassy pools.
The night flings wide her shadowy cape ;
Grass-banks fade to an uncouth shape,
And the mottled waters shiver and gleam,
In the Star of the Evening's dim white beam.

Silence is fallen on field and furrow;
The fowl at his roost, the hare in his burrow.
Lie in the arms of night caress'd,
But life on the jheel is never at rest.
A myriad crickets, the banks along,
Up lift to Heaven their whispered song;
A myriad frogs in throaty choir,
Sing a last long dirge to the Sun's dead fire.
The quick bats flicker and swerve in flight,
From the hungry rush of the swooping kite;
And *Sarus* summons his wayward spouse,
With cry discordant, to join carouse.
But hark! a new sound thrills the sky
Like the rush of the wind in an ecstasy,
Or of cloth-yard shafts, as of yore they flew,
True sped from the cord of the six foot yew.
Nigher it comes, and yet more nigh,
A swirl of shadows o'ercasts the sky.
They're here! They' ve gone! slow dies the sound.
As the duck wing South to their feeding ground.
Again that whistle, again the throb,
Of the swift-driven wings of that ordered mob,
Again the shadows of duck in flight,
Glimpsed in the gloom of the gathering night.
Gun leaps to shoulder from muzzle a roar—
The silence is riven—
The duck fear-driven
Swing from the flash and skyward soar.
But one breaks rank in that rocketing wheel,
And swift glissades to the waiting jheel,
Hit, hard hit; the air he thrashes,
With strengthless wings—and then he splashes!
The splash betrays him—he's gathered in,
Or ever to deep reed-haven he win.
Again and again is borne on the breeze
The whistle and rush of those shadowy V's;
Again, as gun-flash shatters the gloom,
The duck wheel up or fall to their doom.
And birds, that have settled unseen, take flight
On swift-driven pinions into the night.
Then follows of wings a drumming more measured,
The pace is swift, tho' the wing-beats leisured.
The shadows loom larger; the "*honks*" betray,
The grey-goose to water winging their way,
The flight is checked as the grey-goose wheel,
Choosing their spot on the well-stocked jheel.
A shot roars out, another one,
And a grey goose drops to a well-held gun.

ROSTAND.

No. XVI.—A MUGGER SHOOTING EXPERIENCE.

Some years ago I had an experience when mugger shooting on the River Jumna in the Delhi district, and although I have spoken to many shikaris with regard to this I have never heard from any of a similar one. The facts were as follows: We came across a mugger basking in the sun on a bank at a place where the river was about 150 yards wide. I fired at his neck and hit him, but just too low to be immediately fatal. The bullet was a ·303 soft nosed split and we found afterwards had opened out and caused a large wound in its exit. The mugger rushed in the river and disappeared. A little while afterwards he appeared in the centre of the river at short intervals raising his head and neck out of the water and going down again. My shikari explained that the reason for this was that fishes were nipping at the wound in his neck and his pushing his neck out of the water was to get away from them. The shikari said the fish would probably drive him out of the water sooner or later, so we left the river for over an hour in the hope that this would happen. On returning, however, we found the mugger doing exactly the same thing, so I decided to fire, which I did. I hit him on the head, the bullet glancing off. The mugger made a great swish of water and almost jumped out. Then he lay down on the top of the water and made straight for me. I waited till he was about 3 yards from the bank and then fired between his shoulders. This instantly paralysed him and we dragged him out by the tail. We found even then he was not dead as he held on with his teeth firmly to a lathi and it took a ·303 through his brain to finish him. He was a mugger about 13 feet long.

I have never heard of a mugger after being wounded going for the firer, and should be interested to know of any one, having a similar experience.

L. STANSFIELD.

19th February 1924.

No. XVII.—A NOTE ON THE HABITS OF THE LARGE-SCALED EARTH SNAKE *SILYBURA MACROLEPIS.*

This little Earth Snake is very common in Mahableshwar during the rains. It is found chiefly in the rubbish heaps, drains and in the humus of the forest—more commonly at dusk, from which one gathers that it is probably crepuscular or nocturnal in habits, though I have captured one or two during the day. These snakes are most numerous after a shower of rain, which appears to draw them out of their burrows on to the roads and path ways. When alarmed or disturbed in exposed positions these snakes adopt an attitude common more or less to many snakes—they lie perfectly still with the body flattened out to the utmost extent, the object being presumably to escape detection.

The principal food of this earth snake consists of earth worms and small insects, though the former make up the bulk of its diet.

On a walk one evening I picked up one of these snakes and took it along with me. Though extremely slow in movement when on the ground, when picked up it struggled very vigorously. I saw an earth worm on the ground and put the snake down next to the worm to see whether it would attack it. To my satisfaction as soon as the snake noticed the worm it bit it, relaxing its hold immediately afterwards; as the worm continued to wriggle the snake bit it again, whereupon the worm ceased its struggles and lay quite still apparently paralyzed. It might be mentioned here that Revd. Father Caius, S. J., a bio-chemist, who is devoting a considerable amount of attention to the study of snake venoms, informs me that many of the *Silyburidae* secrete a quantity of venom in the parotid glands, which mixing with the saliva, possess sufficient virulence to enable these reptiles to easily overcome their prey. To continue with my experiment, after the worm ceased its struggles the snake commenced swallowing the worm head first. In about two minutes the whole process was complete, a great quantity of earth was forced out of the worm in the act of swallowing, much of which adhered to the mouth of the snake. This the reptile got rid of by rubbing its mouth this way and that on the ground. I picked it up after it had finished its meal, took it home and discovered later that a further quantity of mud had been ejected by the snake after I had put it away.

The natives are extremely afraid of these snakes and as usual have associated it with legendary beliefs of a most alarming character ; a woman who saw me pick one up was horror stricken at the sight and gave vent to screams which promptly brought a crowd around all shouting and gesticulating . On asking what ailed them I was told that the snake would make a knot round my hand and that I would never be able to get out of it.!

When the soil becomes dry these earth snakes burrow down into it. I am inclined to believe that they use their abbreviated tails as stoppers to close the upper ends of their burrows. The burrow it may be explained is not vertical but runs an olique course into the ground. The tail of a Silybura also ends obliquely and when the snake is buried in its burrow the upper surface of the end of the tail lies flush with the ground and thus forms an excellent stopper.

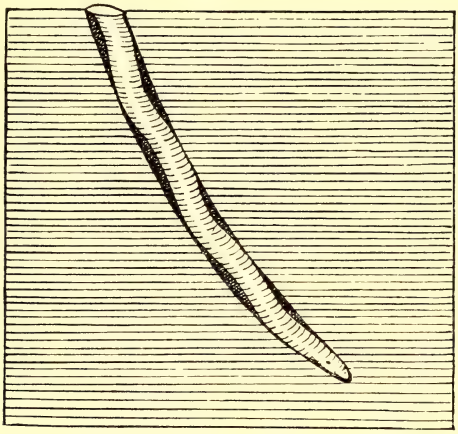


Fig 18—Diagram to illustrate method of closing burrow. The oblique end of the tail lies level with the surface of the ground.

I found one of these snakes in exactly this position and was at once struck with the possibility, that this was an explanation to the abrupt and oblique termination of the tail, which is a characteristic feature in snakes of this family. Further may it not be possible that the rough papillæ with which the ends of the tail of the Silyburids are covered, giving them a rasp like appearance, are of a sensory nature and would therefore be in the nature of an additional safeguard warning the reptile against possible intruders ? Further the end of the tail is tough and coarse—quite different to the smooth and tender texture of the rest of the body. So tender is the texture of the epidermis that these snakes appear to be unable to stand strong direct sunlight for very long. Numbers of them dug up by the road menders become scorched and perish a short time after exposure, hence the toughening of the epidermis at the end of the tail, which while the snake lies in its burrow remains continuously exposed at the surface.

In captivity they should be kept moist with damp earth and fed on earth worms, under these conditions they survive for a long period.

Bombay Natural History Society,

CHARLES McCANN.

January 1924.

No XVIII.—FURTHER NOTES ON THE BREEDING HABITS OF THE PEARL SPOT FISH (*ETROPLUS SURATENSIS*).

In my notes on the Cichlid Fishes of Malabar (Madras Fisheries Bulletin, Vol. XII, No. 5,1920) I have stated that the Fish breeds twice a year. Experiments were afterwards conducted to find out whether the fish could be made to breed more often. The results of these experiments undoubtedly answer the question in the affirmative. A pair of breeders was singled out and kept in an aquarium tank. The record of the successive spawnings is given below:—

9-11-22 .. The pair spawned for the first time and the young were allowed to be cared for about 3 months until they left the parental care.
7- 4-23 .. Spawned the second time and the larvæ hatched out were removed on 12th April 1923.
6- 5-23 .. Spawned the third time. The larvæ removed on 10th May 1923.
17- 5-23 .. Spawned the fourth time. The larvæ removed on 21st May 1923.
4- 6-23 .. Spawned the fifth time. The spawn removed on the same day.
27- 6-23. .. Spawned the sixth time and the spawn removed.
14- 7-23 .. Spawned the seventh time and the spawn removed.
21- 7-23 .. The pair died on account of the washing in of lime into the tank.

The fish is admirably adapted for pond life and is found to thrive well under novel conditions in the irrigation tanks of Shencottah where they have been introduced. The greatest difficulty is now being experienced in acclimatising the fish taken from saline and brackish waters to fresh water conditions and in transporting them to long distances. The larvæ, before the absorption of the yolk sac, can be kept quite safely in small earthern vessels for 7 days and can be conveniently transported in numbers to very distant places. If the attempt to feed and preserve a reasonable number of larvæ far beyond the critical period after the resorption of the yolk until they attain the proper size for stocking is successful most of the difficulties can be said to have been overcome, as a single pair of breeders can be utilised to raise large quantities of larvæ.

QUILON,
19*th January* 1924.

N. P. PANIKKAR, B.A., F.L.S.,
Fishery Inspector.

PROCEEDINGS

PROCEEDINGS OF THE MEETING HELD ON 13TH NOVEMBER 1923.

A meeting of the members of the Bombay Natural History Society and their friends was held in the Prince of Wales' Museum, Bombay, on Tuesday, the 13th November 1923 at 6-30 p.m.

The following 22 new members were elected since the last meeting:—Miss C. G. Kershaw, Ceylon; Capt. J. H. Hislop, M.C., I.M.S., Tibet; Lt. S. F. H. Williams, Bombay; Capt. R. Hay, I.M.S., Nasirabad; Mr. H. M. Glover, Rawalpindi; Mr. J. I. Alfrey, Bombay; Mr. C. E. D. Mears, Indore, C. I.; Commander George Wilson, R.N., East Indies Station; Major R. H. Macdonald, Bombay; Mr. V. Aquino, Bombay; Lt. J. A. Theobalds, Rawalpindi; Mr. F. W. Withers, I.F.S., Rangoon; Mr. L. A. McCoard, Burma; Mr. K. Ringger, Bombay; Capt. S. N. Hayes, I.M.S., Dera Ghazi Khan; Major H. G. Martin, Simla; Mr. V. G. Bell, England; Lt.-Col. B. L. Cole, Jhansi; Major J. C. Tate, I.A., Chhota Udepur; Mr. A. P. F. Hamilton, I.F.S., Sultanpur; Capt. C. Cardew, R.E., Aden; Miss N. F. Loch, Hyderabad, Deccan.

Mr. R. A. Spence, the Honorary Secretary, reported that 22 new members had joined the Society since the last meeting held a month ago. This increase in membership was very encouraging and was an acknowledgment of the value of the work that the Society was doing; he wished at the same time to thank those members who had made a special effort to bring in new members on our roll and he asked those present to help the Society in the same manner. Since the Society had lost the grant, it used to receive for its ordinary work, from Government, it had become more dependent than ever on the individual efforts of its members. It had been his policy to popularise the work of the Society particularly in regard to the Journal by the inclusion of illustrated articles and papers which would interest the lay reader, and the Journals issued during the current year were proof of what had been accomplished in this way. The number now in the Press contained several interesting articles. Among them one on "Animal Life in the Ganges" by Dr. Annandale which formed the subject of a lecture delivered at the Indian Museum sometime ago, and Capt. Hingston's very interesting serial on "The Red Ant." He was glad to say that the Society's monthly meetings at the Prince of Wales' Museum were becoming more and more popular. Members were always welcome to bring their friends to these meetings and he hoped that by their doing so they would make the Society better known. Though the Society was known as the Bombay Natural History Society the list of local members was comparatively small and he was certain that if those present made up their minds to help, this defect would soon be remedied.

THE EXHIBITS.

Mr. S. H. Prater, the Curator, exhibited some mounted birds and casts of fish that had recently been prepared for the Museum in the Society's work rooms. It was his intention to prepare a series of mounted birds illustrating the Game Birds of India and, as a result of appeals sent out, the Society had recently received a handsome pair of Monal and Koklass Pheasants from Mr. Whistler, while further additions to this series had been promised. He asked those present who had the opportunity of shooting during the coming cold weather to remember that the Society would be glad to receive specimens of any Game Birds obtained by them that would be suitable for this purpose.

As regards Mammals the Society had recently received a complete skin of a Kashmir Barasingh (*C. cashmiriensis*) for mounting from Col. Burton, who had also promised to send a pair of Oorial. Major C. H. Stockley, who was at present collecting for the Vernay expedition had also obtained a number of specimens for us, and Major Bailey had secured a complete skin of a Great Tibetan Sheep (*O. ammon hodgsoni*). All these specimens would, he hoped, adorn the Mammal Gallery in the near future. He reminded those present and the public in general that the exhibits at present arranged in the Mammal Gallery were of a purely temporary nature; as fresh specimens were mounted the flat skins would gradually be withdrawn. It meant either having a temporary exhibition of this nature or closing the Gallery to the Public until it was ready. The cases for the bird gallery were now ready and the work of preparing the mounted specimens was being pushed on but the whole matter was a question of time and money.

ILLUSTRATED LANTERN LECTURE.

Mr. J. Addyman, M.L.C., gave those present the benefit of his long experience in a lecture on the Culture and Life of the Honey Bee. Mr. Addyman's lecture was suitably illustrated by his excellent series of lantern slides. The lecturer was heartily thanked by those present.

PROCEEDINGS OF THE ANNUAL MEETING HELD ON 6TH APRIL 1924.

The annual general meeting of the members of the Bombay Natural History Society was held in the Board Room of the Prince of Wales' Museum on Thursday evening at 6 p.m. The Rev. E. Blatter, S. J., presiding.

The following 29 new members were elected since the last meeting:—Mr. Radhakant Malaviya, M.A., LL.B., Bombay; Mr. G. D. Sutherland, Bombay; Lt. K. L. Bodenham, Delhi; Mr. H. H. Sawyer, Bombay; Capt. M. R. Metcalfe, I. A., Deoli; Kumar Shri Nutversinhji of Gondal, Jetalsar, Kathiawar; Capt. D. Moncrief Wright, Quetta; Mr. A. H. Berriff, Simla; Mr. H. F. Mooney, I.F.S., Sambalpur, B.—N. Ry.; Mr. W. J. Barron, Tavoy; Maharaj Kumar Fattehsingh of Ali Rajpur State, Dohad, B. B. & C. I. Ry.; Mr. E. V. D. Chislett, Sion, Bombay; Mr. W. N. R. Kemp, Champaran; Mr. E. J. A. Swan, Papun, Burma; Mr. G. T. Burrows, Papun, Burma; Mr. R. W. H. Davies, I.C.S., Karachi; Mr. D. E. Reuben, I.C.S., Cuttack; Mr. J. W. Rowland, Karachi; Mr. N. K. B. Kurupp, B.A., M.Sc., Quilon; Mr. A. W. J. Symes, Sabarmati; The Right Hon'ble Sir Leslie Wilson, P. C., G.C.I.E., C.M.G., D.S.O., Bombay; Mr. Alwyn Ezra, Bombay; Capt. P. R. H. Skrine, Jhansi; Mr. C. C. Demetriadi, Karachi; Mr. W. H. Workman, F.Z.S., M.B.O.U., Ireland; Mr Hamid Khan, M.Sc., Lahore; Mr. Geo. B. Morton, Calcutta; Mr. Stephen Calvocoressi, Bombay; Mr. A. McLean, Pyinmana, Burma. The appointment of officers for the ensuing year was as follows:—

Patron:—H. R. H. The Prince of Wales.
Vice Patron:—H. H. The Maharao of Cutch.
President:—H. E. Sir Leslie Wilson.
Vice-Presidents:—Sir Norman Macleod, the Maharao of Cutch, and the Rev. E. Blatter.

Managing Committee:—Mr. T. Bainbrigge Fletcher, F.E.S., Pusa; Mr. T. R. Bell, C.I.E., I.F.S. (Retd.), Karwar; Mr. R. D. Bell, C.I.E., I.C.S., Bombay; Mr. J. P. Bradshaw, Bombay; Lt.-Col. W. H. Evans, R. E., Simla; Major F. C. Fraser, I.M.S., Mercara; Dr. N. Annandale, Calcutta; Dr. Gravely, Madras; Mr. J. E. B. Hotson, I.C.S., Bombay; Prof. V. N. Hate, M.A., Bombay; Mr. C. M. Inglis, Darjeeling; Mr. H. F. Lodge, Bombay; Mr. R. C. Lowndes, Bombay; Mr. F. Ludlow M.A., M.B.O.U., I.E.S., Tibet; Sir Henry Macnaghten, Kt., M.A., M.L.C. Bombay; Mr. J. G. Ridland, Bombay; Mr. P. M. D. Sanderson, Bombay; Major C. H. Stockley D.S.O; Dr. D. A. Turkhud, Bombay; Major J. Taylor, I.M.S., Rangoon ; Mr. H. Whistler, F.Z.S., M.B.O.U., C.F.A.O.U., Punjab ; Mr. W. D. Cumming, Quetta ; and Col. F. Wall, I.M.S., Coonoor.

Honorary Treasurer :—Mr. T. A. M. Hill.

Honorary Secretary .—Mr. R. A. Spence. F.Z.S.;

ACCOUNTS FOR 1923.

The Honorary Treasurer, Mr. T. A. M. Hill, who had been on leave for a few months was welcomed back by the members. Mr. R. C. Lowndes who had been acting for him placed before the meeting the audited Statement of accounts for the year 1923 and stated that at the close of the year 1923 the number of members on the books were :—Life Members 155 and Ordinary Members 1,131. During 1923, 186 Members resigned, 93 Members joined and 2 rejoined.

An examination of the Receipts of the Society during the year 1923 shows that subscriptions were approximately Rs. 1,000 less than in 1922, whereas the number of entrance fees shows a small increase over those received last year. The decrease in the subscriptions is apparently due to the fact that twice as many Members resigned from various causes as joined the Society during the year. The number of members who availed themselves of the privilege of becoming Life Members of the Society has still further decreased this year and the receipts on this account are some Rs. 1,250 less than in 1922. The increased subscription has evidently had a deleterious effect upon the membership of the Society, though it is hoped that this is only temporary and it may be mentioned that the number of members who have joined the Society has shown an increase during the last 6 months.

Turning to the expenditure account the most important item of expenditure is the cost of printing the Journal which shews a further increase of nearly Rs. 1,500 over last year, and now costs Rs. 11,400 more to print than it did three years ago, an increase of more than 100 per cent. over 1920 printing charges. The Honorary Secretary has already taken this matter up with the Publishers and it is hoped to obtain some reduction in this item during the current year.

The Prince of Wales' Museum continue to pay 50 per cent. of the salaries of certain of the staff employed by the Society but the salaries have increased during the year by Rs. 3,200 which is due to the gratuity and half pay given to Mr. Ellison on his relinquishing his appointment as curator of the Society on account of ill health. This item will, therefore, not recur in 1924.

Expenditure under practically all other heads shows a decrease and the Honorary Secretary is to be congratulated on the economies he has been able to effect in this respect.

A summary, however, of the receipts other than what should be treated as Capital, and amounts received on account of Game Books, etc., as compared with the Revenue expenditure of the Society, appears to show a deficit on the year of very nearly Rs. 10,000. This can only be improved by an increase of the membership of the Society, and a reduction in the expenditure, principally in the cost of printing the Journal.

With regard to the sale of books, charts, etc., most of the accounts appear satisfactory with the possible exception of the sale of Game Bird Books. There is for this still an amount of Rs. 16,199-1-0 due to publishers, and in addition the Society appears to be out of pocket by a further sum of Rs. 15,946-2-0 at the end of last year. Very little more than half the bound copies have as yet been sold, which accounts for the above position, but if these and the unbound copies can be sold the Society will not only cover out of pocket expenses, but will make quite a reasonable profit. Recent sales have, however, not been as promising as were originally hoped.

MAMMAL FUND.

The fund opened with the balance of Rs. 21,745-15-9, but Rs. 2,922-11-7 only having been received during the year it closed with a balance of only just over Rs. 10,000. Salaries will again be less this year, but I cannot add to what was said last year, namely, that as it is unlikely that fresh funds will be forthcoming it will be necessary to rely in future principally on work being done for us by honorary workers.

The formal business having been concluded the members adjourned to the Natural History Section of the Museum. Considerable interest was shewn in the many recent additions mounted by the Curator and his Staff.

BOMBAY NATURAL HISTORY SOCIETY.

STATEMENT of ACCOUNTS from 1st January 1923 to 31st December 1923.

RECEIPTS.	Rs.	a.	p.	Rs.	a.	p.
Opening balance on 1st January 1923.						
Fixed Deposit with the Central Bank of India ..	25,000	0	0			
Balance on current account with the National Bank of India	1,575	7	6			
Cash on Hand	250	0	0			
Balance on current account with the National Bank of India, London £598-10-11 at ¼ ..	8,978	3	0	35,803	10	6
Collection of Subscriptions in arrears	830	14	0			
,, ,, ,, for current year ..	25,425	6	3			
,, ,, ,, in advance	2,793	0	0			
	29,049	4	3			
Less—Refund of Subscriptions ..	616	8	0	28,432	12	3
Life Membership Subscriptions	1,650	0	0			
Entrance Fees	1,680	0	0	3,330	0	0
Registration fee	365	1	0			
Sales of Journals	2,044	12	8			
,, ,, Snake Charts	1,104	8	0			
,, ,, Game Books	3,846	7	0			
,, ,, Snake Books	184	14	0			
,, ,, Pigeon Books	333	12	0			
Other Printed matters	447	0	0			
Sale of list of Butterflies	13	8	0			
,, ,, Iraq Fauna	88	0	0			
Taxidermy Charges	60	0	0			
Sales of Plates	302	8	0			
Charges recovered	431	3	0			
Sundries	368	7	9			
Profit on exchange	246	4	0			
Interest on Investments, etc.	3,948	11	11			
Receipts from Advertisements in the Journals	464	2	2	14,249	3	6
Printing charges recovered from Iraq Government	....			5,000	0	0
Advance to staff recovered (1921-22)	130	0	0			
,, ,, ,, ,, (1923)	360	0	0	990	0	0
				87,805	10	3

PAYMENTS.	Rs.	a.	p.	Rs.	a.	p.
Journal Account	21,009	1	9			
Salaries	17,614	9	0			
General Charges, Petty cash, etc.	1,466	3	0			
Rent	2,813	5	0			
Printing and Stationery	721	6	6			
Postage	1,783	13	0			
Library Account	351	14	0			
Furniture Account	67	12	0			
Audit Fee	250	0	0			
Fire Insurance Premium	260	15	0			
Iraq Fauna Printing charges, Times Press ..	2,560	2	0			
Travelling expenses of Mr. Prater in England ..	225	0	0			
Messrs. Bale Sons, Printing charges of G. Books.	22,500	0	0			
Passage for Mr. Ellison	1,117	7	3			
Profit on Snake Books paid to Col. Wall	563	0	0	73,304	8	6
Amount advanced to Staff during 1923	....			1,120	0	0
Fixed Deposit with N. T. Society	6,000	0	0			
Balance on current account with the National Bank of India	4,560	10	9			
Cash on hand	250	0	6			
Balance on current account with the National Bank of India, London £ 171-7-3 at ¼	2,570	7	0	13,381	1	9
				87,805	10	3
Securities with the National Bank of India, Ltd., Bombay.						
3½ % Government of India Promissory Notes.	8,800	0	0			
4 % Government of India Conversion Loan.	10,000	0	0			
4 % Bombay Port Trust Unguaranteed Bonds	14,000	0	0			
4 % City of Bombay Improvement Trust Bonds	15,000	0	0			
6½ % Bombay Development Loans	8,000	0	0			
6 % Bonds 1926 Promissory Notes	10,000	0	0			
	Rs. 65,800	0	0			

BOMBAY, 12*th February* 1924.

We have seen a letter from the National Bank of India, Limited, to the effect that the above Securities were held on Society's behalf on 31st December 1923 as also a certificate from the National Bank, London, for the balance with them.

Examined and found correct.
(Sd.) A. F. FERGUSON & Co.,
Chartered Accountants, Auditors.

(Sd.) R. C. LOWNDES,
Honorary Treasurer,
Bombay Natural History Society.

(Sd.) A. F. FERGUSON & CO.
Chartered Accountants, Auditors.

MAMMAL FUND ACCOUNT.

BOMBAY NATURAL HISTORY SOCIETY.

STATEMENT of ACCOUNTS from 1st January 1923 to 31st December 1923.

	Rs. a. p.	Rs. a. p.		Rs. a. p.	Rs a. p.
OPENING BALANCE ON 1ST JANUARY 1923.			Salary of Mr. Wells	4,200 4 0	
Fixed Deposit with the Central Bank of India, Limited, Bombay	20,000 0 0		,, Mr. McCann	3,200 0 0	
			,, Mr. LaPersonne	1,179 0 6	
			,, Mr. Baptista	1,290 0 0	
			,, Pechimuttu	135 0 0	
On current account with the National Bank ..	1,745 15 8				10,004 4 6
		21,745 15 8	Cost of Cartridges..	54 0 0	
			Audit Fee	30 0 0	
Donations received during 1923	2,010 0 0		Freight on specimen boxes	384 5 6	
			Travelling expenses to Collectors	690 8 6	
			General expenses and sundries	403 6 0	
Interest on current account	28 1 9		Postage and Telegrams	71 0 6	
			Collecting expenses	1,624 10 9	
			Cost of Gun	200 0 0	
Interest on Fixed Deposit	884 9 10		Passage for Mr. Wells to London	898 3 11	
			Cost of Traps	154 14 0	
		2,922 11 7			4,511 1 2
			Fixed Deposit with Netherland Trading Society at 3½ per cent.	9,000 0 0	
			On current account with the National Bank of India, Bombay	1,153 5 7	
					10,153 5 7
		24,668 11 3			24,668 11 3

BOMBAY, 12*th February* 1924.

Examined and found correct.
(Sd. A. F FERGUSON & Co.,
Chartered Accountants, Auditors.

(Sd.) R. C. LOWNDES,
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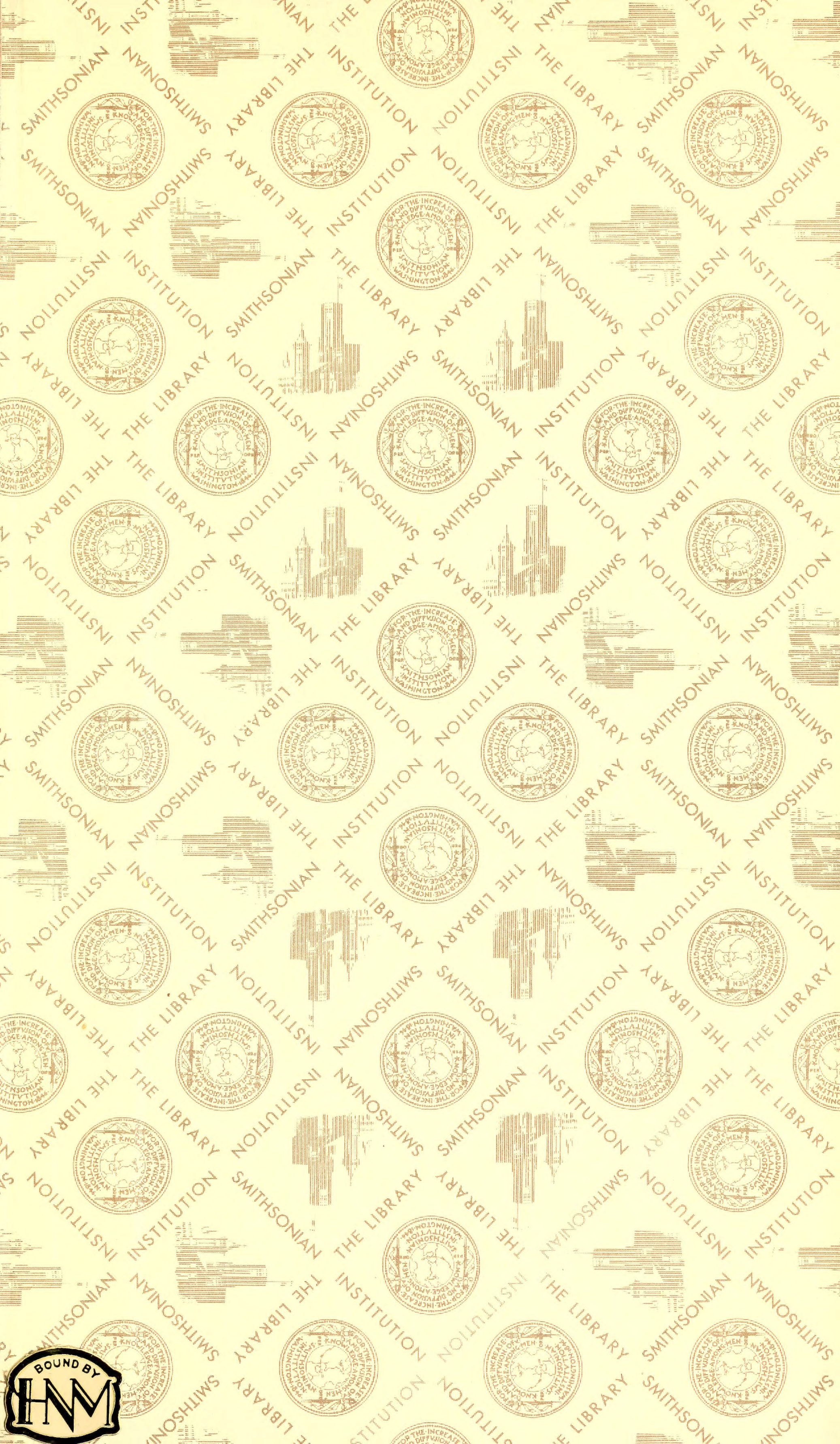

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